DEFECTS

OF

SIGHT AND HEARING;

THEIR NATURE, CAUSES, PREVENTION, AND GENERAL MANAGEMENT.

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BY

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Approving of the matter contained in this small volume, and knowing it will be found useful to all who may consult it as a guide to the care of one of the most important of our senses, I considered it incomplete without a few observations on the *care* of the *Ear*, an organ equal in importance to the Eye, and not as well protected by nature; complete deafness is also believed, by many good authorities, to be a greater evil than blindness, (See Introduction.) Loss of hearing is most apt to arise from want of proper care and knowledge of the delicate mechanism of the internal ear. The suggestions added to this volume will tend, I trust, to diminish the number of the deaf, and also to inform those who have already become so, of the means of alleviating this great evil by the use of artificial membranes, and also by the aid of the hearing trumpet, an account of which has been introduced. The additions of the American editor on the Eye are enclosed in brackets, consisting principally in a fuller exposition of the interesting subject of "Color-Blindness;" the

application of the Ophthalmoscope to the diagnosis of certain obscure diseases of the Eye; a notice of Artificial Eyes, and their mode of introduction; also an article on the proper use of Spectacles, by my friend Mr. Queen, of this city, a pupil of the distinguished optician and philanthropic gentleman, John McAllister, Esq.

Should the work pass through a second edition, I shall be glad to make the additions more numerous. The opportunities of the American Editor, for seeing diseases of the Ear, have been good, as he has charge of that department in the only institution in this city, which makes this a distinct and special object of care and attention.

THE EDITOR.

1208 Spruce Street, Philadelphia.

December 1, 1858.

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TO THE FIRST LONDON EDITION.

Much of the mortality which figures in the Registrar-General's Reports, it has been shown, might be prevented by attention to sanitary measures. In like manner, much of the defective sight and blindness which we meet with is the result of disease, either preventible altogether, or at least curable if taken in time.

Impressed with this fact, it has occurred to me that a small volume containing some guiding principles relative to the care and preservation of the sight would be useful. Accordingly, I have thrown together, in the following pages, such observations on the subject as appear to me calculated to answer the end in view.

THE AUTHOR.

35 George Street, Hanover Square,
London, August 1, 1856.

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DEFECTS OF SIGHT:

THEIR NATURE, CAUSES, PREVENTION, AND GENERAL MANAGEMENT.

PART I.

CHAPTER I.

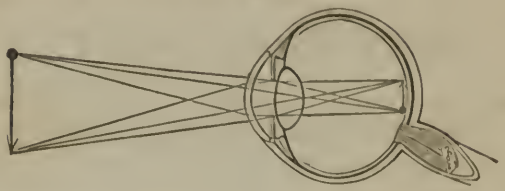
STRUCTURE OF THE EYES AND NATURE OF THE SENSE OF SIGHT.

THE optic nerves or special nerves of sight—two in number—are each at one end connected with the brain, and at the other expanded into a nervous membrane, named *retina*, which lines the interior of the back part of the eyeball.

Like telegraphic wires, the optic nerves constitute the media of transmission between the retina, on which the impressions of sight are made, and the brain, where the sensations of sight are perceived.

The segment of the eyeball in front of the retina is a dioptric apparatus or system of lenses, by which the rays of light entering the eye from external objects are so refracted or bent that they are made to converge and come to foci or points on the retina. Images of the objects from which

the light comes are thus projected on that membrane as on the table of a camera obscura, thus:—



The impression so made on the retina being transmitted by the optic nerve to the brain, a visual sensation of the object is excited in the mind, or, in common language, *we see* it.

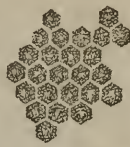
Structure of the Eyeball.

Horizontal section of the right human eyeball, natural size.

Optically considered, the eyeball is, in its construction, a true camera obscura.

The wall of the ocular chamber is composed externally of the *sclerotic coat* (*a*,) except anteriorly, where it is formed by the transparent *cornea* (*b*,) which, like a window, closes in the front of the eyeball. The sclerotic coat is lined inside by one more delicate, named the *choroid coat* (*c*,) which contains much dark pigment dispersed throughout its substance. Towards the place where the

sclerotic joins the cornea, the choroid coat presents a peculiar plicated structure called *ciliary body* (*d.*) On the inner surface of the choroid coat again, there is a mosaic pavement-like work of flat six-sided cells of microscopical minuteness, filled with dark brown particles, forming the *proper pigment membrane*, by which the interior of the ocular camera is darkened for a purpose corresponding to that for which opticians obscure the interior of their instruments by painting them black, viz., in order that any extraneous rays of light may be absorbed and prevented from interfering with the distinctness of the image formed on the table of the camera.



Had the interior of our eyes been undarkened, not only would our sight have been indistinct, but we should have suffered from a painful dazzling in the exercise of vision in bright light, as is the case with Albinos, in whom the pigment of the eyes, as well as that of the skin, is deficient.

Situated behind the transparent cornea, and supported on both surfaces by the aqueous humor, is seen the *iris* (*e e,*) a flat circular membrane, perforated by a round aperture, called the *pupil* (*f.*) The anterior surface of the iris, as seen through the transparent cornea in the living eye, is differently colored in different individuals—blue, hazel, &c. : indeed, it is the color of the anterior surface of the iris which, in common language, is spoken of as the color of the eye generally; thus, a blue eye or hazel eye, means merely an eye with a blue iris or one with a hazel-colored iris. The posterior surface of the iris is invested with a dark pigment-membrane, which is a modified continuation of that lining the inner surface of the choroid coat.

The iris perforated by the pupil, thus situated behind the transparent cornea, is, in the camera of the eye, what the shutter with the hole in it is in the primitive form of the camera obscura, or what a stop or diaphragm is in more perfect instruments. But more than this, it is a stop or diaphragm, the aperture of which is variable in size, and self-adjusting: by means of the contractile power with which the iris is endowed, the pupil admits of being varied in size, but not alone this,—there is a provision by which the contractile power of the iris is called into operation without any effort on our part, under the very circumstances which require the variation in the size of the pupil, viz., in bright light, contraction—in dull light, dilatation of that aperture.

The *retina* (*i*), or expansion of the optic nerve, it has been above mentioned, lines the interior of the back part of the eyeball, being situated within the pigment membrane, and is the table on which, in our ocular camera obscura, the image of external objects is projected by the dioptric apparatus placed immediately in front of it.

The dioptric apparatus of the eye consists of the *vitreous humor*, the *crystalline lens*, the *aqueous humor*, and the *cornea*.

The *vitreous humor* (*k*) is a transparent jelly-like mass, which fills up the posterior and middle part of the interior of the eyeball. It is concavo-convex in shape. Its convexity, which is behind, is in close apposition with the concave surface of the retina; in its concavity, which is directed forward, the crystalline lens lies imbedded.

The *crystalline lens* (*l*) is double convex, but unequally so. The more convex surface is the posterior, and is sunk

in the concavity which the vitreous humor presents anteriorly.

In front of the crystalline lens is the *aqueous humor* (*m*), which owes its shape to that of the cavity wherein it is contained. The cavity in question is convex anteriorly, and concave posteriorly, being bounded in the former direction by the posterior and concave surface of the cornea; and in the latter direction by the anterior convex surface of the crystalline lens. Furthermore, this cavity containing the aqueous humor is subdivided by the iris into two compartments, communicating through the pupil, called the *anterior and posterior chambers of the aqueous humor.*

Lastly, the transparent watch-glass shaped *cornea,* at the same time that it closes in the front of the eye-ball, forms an important part of the dioptric apparatus.

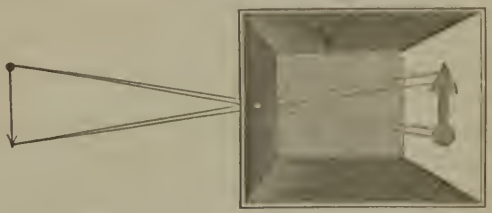
Of the Projection of Images on the Retina.

In order that the mechanism by which images are projected on the retina may be more readily understood, it will be useful to premise a brief explanation of the projection of images on the table of the *camera obscura.*

It is a law of light, that its rays, as long as they continue in the same medium, proceed in straight lines. Of the rays of light which diverge in straight lines in all directions from the different points of any external object, some will enter a hole in the shutter of a window looking towards the object, while others will be stopped by the shutter. The rays which enter the hole continue their straight course within the chamber, the window of which is closed by the shutter, until they are stopped by the opposite wall, or by a sheet of white paper held up opposite the hole in the

shutter. On the wall, or on the sheet of paper on which the rays of light are received, there is seen a picture of the external object whence the rays of light, which entered the hole of the shutter, came.

In regard to this picture, it is to be observed that it is inverted and ill-defined, thus:

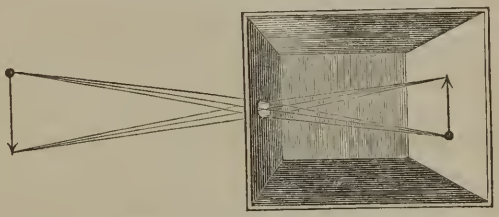


The cause of the inversion of the picture, it will be seen from the diagram, is that the rays of light from the upper part of the object which enter the hole, continuing their rectilineal progression within the chamber, necessarily impinge on the lower part of the wall or paper, while the rays from the lower part of the object as necessarily impinge on the upper part of the wall or paper; and so on with the rays from the sides and intermediate points of the object.

The cause of the imperfect definition of the picture, again, is, that the rays of light which form it do not impinge on the wall or paper in points or foci corresponding to those of the object whence they issued, but in a state of divergence, as may be seen in the diagram.

If a convex lens be inserted in the hole of the shutter, the image is no longer indistinct, but well-defined when the sheet of paper on which it is projected is held at a certain distance behind the lens. The explanation of this is, that the rays of light diverging from all the different points of

the object are so refracted or bent from their original direction in passing through the convex lens, that they are rendered convergent, and so meet again in foci or points, as they fall on the sheet of paper, corresponding to those points of the external object whence they originally diverged, thus :



It will be seen from the diagram, that though distinct from accurate definition, the picture is still inverted, for the same reason that the picture, formed without a lens in the hole of the shutter, is inverted.

To come to the projection of images on the retina :

That a well-defined picture is projected on the retina, as shown in the diagram (p. 14,) may be actually demonstrated by taking the eye of an animal newly slaughtered, such as an ox or a sheep, and cutting away a piece of the sclerotic and choroid coats at its back part, when by directing the cornea towards any object, a lighted candle for instance, we shall see a small inverted picture of the object shining through on the exposed retina like the image on the screen of the phantasmagoria. A similar demonstration may be given on a white rabbit's eye, without other preparation than dissecting clean the posterior surface of the sclerotica.

Like the lens of the camera obscura, the ocular dioptric apparatus so refracts or bends the rays of light, which enter

the eye in a state of divergence from the several points of an external object, that they are made to converge to points or foci. These points or foci of light impinge on the retina, as on the table of a camera obscura, in the same relative order as that in which the rays forming them originally diverged from the several points of the external object.

As to the particular action of the dioptric parts of the eye on the rays of light in their course to the retina: of the pencils of rays diverging from the various points of external objects, those only which fall on the cornea, and are transmitted by it to the aqueous humor, and thence through the pupil to the retina, are concerned in vision. Those rays which fall on and pass through the circumferential part of the cornea, are stopped by the iris, and are either reflected or absorbed by it. The effect of the refraction by the cornea, and of that by the different humors on the rays, is to make them converge; hence, each pencil represents two cones, with their bases touching each other at the anterior surface of the cornea, fig. 1, p. 14.

Of all the dioptric parts of the eye, the cornea is that which contributes most to the convergence of the rays of light. This is because the rays enter it from the air, which is of so much less refractive density than the cornea. The crystalline lens, though double convex, and of greater refractive density than the cornea, contributes comparatively little to the convergence of the rays of light, because the latter enter the crystalline lens from the aqueous humor, the refractive density of which is not so much exceeded by that of the crystalline as the refractive density of the air is by that of the cornea. The aqueous humor being somewhat less dense than the cornea, and presenting a convex

surface to the incident rays, the convergence which the light acquired in passing through the cornea is slightly diminished on entering it. The vitreous humor, on the contrary, continues, and slightly augments the convergence of the rays which enter it from the crystalline lens, as it is of less density than that body, and presents a concave surface to the incident rays.

The curvatures of the refractive media of the eye are not spherical, but such as are calculated to bring all the rays of light to one focus, so that there is no spherical aberration. In like manner, the concave surface of the retina is not spherical, but of such a curvature as to be in its principal parts at a due focal distance behind the cornea and lens, one of the conditions for the prevention of distantial aberration.*

Vital Action of the Optic Nervous Apparatus.

The act of seeing consists in the mind's perceiving the sensations of light and color excited by the impressions on the retina made, in the manner now explained, by external objects through the medium of the external agent, light. The sensations of light and color, and the ideas which the mind reads off therefrom respecting the form, &c., of external objects, depends wholly on the living actions and endowments of the optic nervous apparatus, and the co-operation of the mind through its organ, the brain. When

* See, for further details regarding the curvatures of the eye, my "Anatomical Introduction, explanatory of a horizontal section of the human Eyeball," in Mackenzie's "Practical Treatise on Diseases of the Eye," 4th ed., London, Longman and Co., 1854. And for details regarding the correction of the optical aberrations in the eye, see my "Essay on the Wisdom and Beneficence of the Almighty as displayed in the Sense of Vision," London, Churchill, 1851.

the optic nervous apparatus is paralyzed, it is no longer susceptible to the impression of light; hence, though the dioptric apparatus of the eye perfectly performs its function, there is blindness—the camera obscura in vain throws the picture on the insensible retina.

In the exercise of vision, we refer our perceptions to without and to some distance from the eye, taking no cognizance of the fact that the impression exciting the sensation is actually made on the retina, nor of the intervention of the impressing agent, light.

Whether the perception of externality or outness depend on an original connate law of the economy, or on experience and association acquired through the touch? has been a question with philosophers.

Among other arguments in support of the opinion that we do not originally perceive objects to be *out* from the body, but that the mind originally refers the visual sensation to the eye, as it does a tactile sensation to the point of the finger; and that it is only by experience, through touch, that we learn to perceive the outness of visible objects, the statements of persons born blind from cataract, who have acquired sight by an operation, have been adduced. Some of these persons have alleged that when they first acquired sight, they thought all things touched the eyes. But this, it could easily be shown, is merely loose figurative language. Even if the fact were as stated, it would, if strictly examined, prove no support to the opinion, because it was merely the surface of the eye which was alleged to be the seat of the sensation, whereas it ought to have been the retina, and the person ought, therefore, to have supposed that objects not only touched, but were actually in the eye.

Much more trustworthy evidence of what is the fact is supplied us by infants and the young of the lower animals. An infant grasps at external objects. A chick, on emerging from the shell, will run and pick up a grain; an act the animal would not likely perform if it referred the grain to the interior of its own eye, instead of to without, and to some distance from its body.

I have no hesitation in expressing my belief that our faculty of perceiving outness is truly dependent on an original connate law of our minds. In support of this, I would borrow an illustration from the sense of touch itself —the very sense which is relied on in favor of the opposite side of the question. The illustration I would adduce, is the well-known fact, that persons who have had the misfortune to lose a limb, sometimes feel as if the lost organ were still in connection with the body, and that some part of it, perhaps, is the seat of pain. Thus, to quote from the "Spectator:" "The poor fellow who lost his arm last siege, will tell you, he feels the fingers that were buried in Flanders ache every cold morning at Chelsea."*

Mechanism of the Movements of the Eyeballs.

Of a globular form, each eyeball lies safely lodged in its socket, where it is so balanced in the orbital capsule, as to admit of being turned in all directions, within certain limits, by the action of its six muscles. These muscles acting singly, make it revolve in so many different direc-

* For further details on this subject, and its bearing on the explanation of erect vision, though retinal impressions are inverted, of the apparent size of objects, and of single vision with two eyes: See my Essay on "The Wisdom and Beneficence of the Almighty as displayed in the Sense of Vision," above referred to.

tions—inwards, outwards, upwards, downwards, obliquely downwards, obliquely upwards—on three imaginary axes; but acting in various combinations, they make it revolve, on other axes, in various other directions.

The two eyeballs move in concert, and in order to this, their different muscles act in various combinations, sometimes as associates, sometimes as antagonists, according to the manner in which the eyeballs require to be directed, so that their axes may meet at the object looked at, their centres of revolution coincide, and their vertical and horizontal diameters be parallel—conditions necessary for the simultaneous projection of the images of objects on the corresponding parts of the two retinæ.

Mechanism of the Movements of the Eyelids.

At the same time that the eyeballs are so placed in the head and moved, that they may be directed to the various objects in the field of view, they are securely protected from any ordinary violence.

The upper eyelid is kept raised by a muscle for the purpose (the *levator*,) whilst the lower eyelid is held down by its own elasticity and that of the cheek. There is a proper muscle for closing the eyelids, namely, the *orbicular*. The action of the levator muscle of the upper eyelid being suspended in sleep, it is partly by the weight and elasticity of the eyelid, and partly by the unrestrained action of the orbicular muscle, that the eyes are kept closed. It is also by the momentary action of the same muscle every now and then that winking is caused; overcoming the action of the levator muscle of the upper eyelid and the elasticity of the lower, it draws down the upper, and raises the lower eyelid considerably.

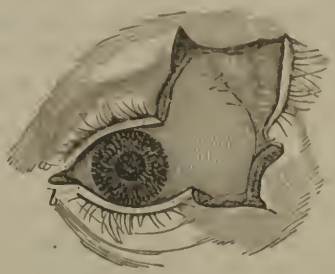
Mechanism of the Lachrymal Apparatus, &c.

For the lubrication and protection of the delicate and sensitive borders of the eyelids, an unctuous matter is poured out on their surface by the minute mouths of the ducts of the Meibomian glands. These mouths may be seen on close inspection of the surface of the broad border of the eyelids, arranged in a row all along.

The source of the tears is the lachrymal gland, which is situated above and to the outer side of the eyeball, securely lodged in a pit behind the edge of the socket. When the tears are poured out in unusual quantity, as they are in certain affections of the mind, and in consequence of irritation of the eye from the intrusion of foreign particles or the like, they run over the margin of the lower eyelid, and drop down the cheek. A flow of tears in a less degree is, however, constantly taking place, by which the transparent front of the eyeball and the surfaces of the conjunctiva in general are washed and maintained in a moist state. The direction in which the tears flow over the surfaces mentioned, is from above and near the outer corner of the eye, where the ducts of the lachrymal gland open and discharge them, downwards to the inner corner, whence, as they accumulate, they are drawn off into the nose by the derivative lachrymal passages.

At the termination of the firm border of each eyelid towards the inner corner, there is a slightly prominent papilla, with a small orifice at its point. These papillæ are directed towards the pit or depression at the inner corner (named *lachrymal lake,*) where the tears accumulate. By the two orifices which lead each into a small duct or canal, the tears are absorbed, and by the ducts are conveyed into the lachrymal sac which lies concealed under the skin, in

a particular groove of the orbit, at the inner corner of the eye. From the lachrymal sac, the tears pass, by the nasal duct, into the nose.



An eye, with the eyelids divided vertically, and the outer halves everted, to show the orifices of the ducts of the lachrymal gland, into which hairs are inserted. The letters *a* and *b* indicate respectively the upper and the lower lachrymal points. Along the border of the eyelids are observed the Meibomian apertures.

The mechanism by which the eyelids are moved, and the tears drained away into the nose, is perhaps most strikingly illustrated when it is anywise disturbed by disease. Thus the levator muscle of the upper eyelid is sometimes paralyzed, in which case the upper eyelid hangs down over the eye, in consequence of the unrestrained action of the orbicular muscle. Again, the orbicular muscle may be paralyzed, in which case the eyelids cannot be closed, the upper being kept elevated by its levator muscle, and the lower depressed by its own elasticity and that of the cheek. Then as to the draining away of the tears into the nose, this may be prevented by obstruction of the lachrymal passages; or by the tears not being absorbed by the lachrymal points, owing to the papillæ being no longer duly directed to the lachrymal lake at the inner corner, in consequence of paralysis of the orbicular muscle.

CHAPTER II.

CHOICE OF LIGHT FOR WORKING BY, AND GENERAL PRECAUTIONS TO BE OBSERVED IN THE EMPLOYMENT OF THE SIGHT.

LIGHT, we have seen, is the agent through the medium of which external objects make their impressions on the sense of sight. We know by experience that a certain moderate intensity of illumination is that by which we can see objects at once most distinctly and most comfortably.

Strong light dazzles and confuses the vision at the same time that it pains the eyes, determines the blood to them, and excites a flow of tears. It is only after some time, perhaps, that the eyes recover themselves. If the light has been very intense—the direct light of the sun concentrated, for example—the spot of the retina impressed may remain affected by it even to insensibility.

The attempt to exercise the sight by too weak illumination, on the other hand, strains and fatigues the eyes in a manner scarcely less injurious.

It is daylight alone which affords that degree and kind of illumination of objects which we find most agreeable to the eyes, and by which we can longest and with the least fatigue exercise the sight.

Artificial lights of all kinds are much inferior. The mild diffusion of the light of day, with the necessary intensity, uniformity, and steadiness, can be but imperfectly

imitated in artificial light, which is usually either too concentrated or too weak and unequal and flickering in comparison. And then in respect to quality, what a difference is there to the eyes between working in the clear colorless light of day and the dingy red and yellow light obtained by combustion!

Our own natural feelings—a good monitor to be guided by in regulating the quantity and quality of the light to which the eyes are exposed,—warn us that work at all trying to the sight is best done by day. And to have daylight as long as possible for our work, we should follow the primitive fashion of rising with the sun. Work requiring least exertion of the vision may be done by artificial light. Students and others, therefore, who have to read and write much, should read by day and write in the evening. In like manner, seamstresses should do fine and dark-colored work by day and coarser and lighter colored work by candle-light.

The window by which we read, write, draw, sew, or do other such work should look towards the north rather than towards other directions. And the desk or work-table should be so placed that the light from the window may fall obliquely from behind and over the left shoulder on the book, paper, or work. By this arrangement the light does not fall directly into our eyes, nor is it reflected directly back from the object into them.

We ought never to exert the sight with the sun shining on the work.

As working in too weak a light is as injurious to vision as working in too strong a light, we must not continue poring over the book or seam when the light of day fails so

that it is necessary to hold the object nearer in order to see it.

When we use artificial light for working by, it should be, as far as possible, sufficiently bright without being dazzling.

For reading, writing, or sewing by, the light yielded by two or three composite candles is, perhaps, the best. The light is sufficient in quantity, and, at the same time, mild and not very much colored; and if there be no draughts of air in the apartment, sufficiently uniform and steady. The candles should be placed to the left of the desk, and a little in front, and still less brought between the eyes and the object looked at, as is sometimes done by far-sighted people.

If the room be large, it is well, in addition, to illuminate it generally, and for this purpose nothing is better than a moderator lamp, placed somewhere in the middle. If gas light be employed, the burners should be suspended from the middle of the ceiling and provision made for due ventilation. [The best form of gas burner is the Argand, being free from the flickering light of the common gas burners in use.] In either case the light should be moderated and diffused by means of an obscured glass globe. The light from lamps with opaque shades and the light concentrated by glass globes filled with water, as used by watchmakers, jewelers, and other such workmen, are by no means favorable to the eyesight. They should be used, therefore, as little as possible.

Glaring and flickering lights irritate the eye even when not employed in any examination; but when so employed such light is extremely detrimental. We should not read,

write, draw, sew, or the like, under the shade of a tree for any length of time, as every now and then, in consequence of the motion of the leaves by the wind, streams of bright light alternately with shadows fall irregularly on the paper or seam. We ought never to attempt reading, nor indeed doing anything by the flickering light of a fire. Open cooking fires are bad for the eyes, both by their blinding light and radiating heat.

Much exertion of the eyes operates more prejudicially to the sight under some circumstances than under others. Exertion of the sight is especially prejudicial immediately after a full meal, after the use of spirituous drinks, while smoking, when the body is in a recumbent or stooping posture, when dressed in tight clothing, especially tight neck-cloth, tight corsets, and even tight boots or shoes, in close ill-ventilated apartments lighted with gas, after bodily fatigue, during mental distress, late at night when sleepy, after a sleepless night, while the bowels are much confined, during convalescence from debilitating illness. Though during recovery from severe disease, the eyes cannot bear much exertion, yet, for want of other employment, it is not uncommon for convalescents to read even more than when in health. Many persons have very much injured their sight in this way.

Patients confined to bed are apt, from mere listlessness, to tire their eyes in tracing the pattern of the bed-curtains or of the paper-hangings on the wall.

Young growing persons, persons at the age of puberty, persons of weakly constitution, are incapable of supporting much exertion of the eyes without injury to the sight.

The eyes of children are often too much tried at school,

and the ground is thus laid for future weak-sightedness of different kinds.

Reading and Writing.—In some cases, especially when the health is naturally good, or care is taken of it, and attention is paid to the conditions under which the sight may be most safely exerted, the eyes, though much tried, whether by daylight or by artificial light, will continue to stand exertion in reading and writing very well. In many cases, however, continued reading and writing, especially by artificial light, proves very hurtful to the sight, and reading more so than writing.

When we have to read much, we should not read very quickly. Reading a novel is more fatiguing to the sight than reading a historical narrative or scientific work, because in the former case we read faster; whereas, in the latter, thinking alternates with the use of the eyes in reading. Reading from a broad page with the lines long and the print small is very tiresome, as it is difficult for the eye always to take up the next line.

Writing down one's own thoughts, or to dictation, requires comparatively little exertion of the sight, not more than to see to place the words in proper order on the paper.

Copying is more trying to the eyes than even reading, as it is both reading and writing and looking backward and forward in addition.

It is not good to read or right at a flat table so that we are compelled to stoop. An elevated desk is better, especially one at which the student stands.

Reading in bed by daylight is injurious, but still more so is reading in bed by candle-light. The eyes are very much strained. The practice is especially prejudicial when

one is weak after illness. Very obstinate Asthenopy or weaksightedness, with pain, in a lady, was brought on by reading in bed during her confinement.

It is very trying to the sight to read when driving in a carriage, or when walking, as, on account of the constant motion, the eyes are compelled every moment suddenly to alter their adjustments. If there be sunshine, the circumstances are still worse, for at one time the page may be shaded by the body, and at another, in consequence of a change of position, it may be brightly illuminated by the light falling directly on it.

In the course of a long journey it is better to suffer *ennui* than strain the eyes by reading.

A distinguished mathematician, in an article on printed tables, expresses himself as "decidedly of opinion that the substitution of dull and rather dark paper for the bright and shining material now in general use, which dazzles the eye too much, is very desirable. Tables," he remarks, "should not be hot-pressed, and not even pressed at all. The mischiefs of pressure are twofold; first, the smooth surface thereby created makes the page a kind of mirror which has a bright image in one place, whereas rough paper dissipates the light equally in all directions; secondly, the other side of the leaf shows through much more after pressure than before. It is also a mistake to suppose that great blackness in the ink, combined with great whiteness in the paper, is favorable to the reader. Every increase of the contrast, over and above what is necessary to perfect legibility, is injurious to it; jet upon snow would in time destroy the strongest eyes. Of all the things meant to be read, a black monumental inscription on white marble in a bright

light, is about the most difficult. One would suppose, to look at our specimens of extensive printing, that such an inscription was the model which it was intended to imitate, and, if possible, to surpass. We are satisfied, after many trials and comparisons, that a dull paper, of a whitish-brown character, too thick to be seen through, and an ink which is of a dull brown black, as it were, the deepest shade of the colour of the paper itself, are the things which are permanently agreeable to most eyes. Those who try it should remember that the first page read is not so good a test as the hundredth.

"One of the most legible books we know of is the trade edition of Gibbon's 'Decline and Fall,' &c., in 12 vols., 8vo, London, 1820. It is considered by the booksellers themselves to be very badly executed. But printers and publishers are too much in the habit of forgetting that a book is a book, and not a line engraving. They look at the page as a whole, and if the individual lines stand out and make their separate existences too perceptible, they pronounce it ugly. Accordingly, the uglier they hold it to be, the more legible the reader will pronounce it."*

The cautions above recommended to be observed for the preservation of the sight in reading and writing, are in all respects applicable to sewing and other similar employments. Unfortunately, however, it often happens that workpeople cannot help themselves, and their sight is sacrificed to the necessities of their circumstances.

* Article "Table" in the National Cyclopædia of Useful Knowledge. London, Charles Knight, 1850.

CHAPTER III.

DANGERS TO THE SIGHT TO BE PARTICULARLY GUARDED AGAINST.

Injuries of the Eyes.

Chemical or mechanical irritation of the eyes excites closure of the eyelids, and the discharge of a flood of tears. If the irritation have been produced by a substance in the state of vapor, the eye is, in this way, protected from its further action and the smarting soon subsides. Strong acid vapors, however—of nitrous or hydrochloric acid—may at once produce serious injury of the cornea.

Particles of dust are sometimes washed out by the tears, the discharge of which they have excited, or may be found after some time lying enveloped in mucus in the inner corner of the eye, having been carried thither by the movements of the eyelids and the stream of tears. A foreign particle is very apt to adhere to the inner surface of the upper eyelid, where it causes great pain by being pressed against the surface of the eyeball. On raising and everting the upper lid, the offending particle will be discovered, and may be removed with a bit of paper. Foreign bodies within the lower lid can be more easily detected and removed.

Foreign particles often adhere to the front of the eyeball, generally the surface of the cornea. This often happens to workmen in various operations; ignited sparks call-

ed *fires* projected against the eye sink into the substance of the cornea.

If the removal is effected soon, the distress is in general relieved, or greatly mitigated. Sometimes a sensation remains as if the body were still in the eye, owing to abrasion of the surface. Lime is very fatal to the eye. Slaked lime less so than quick lime. [One of the best applications when lime has been forced into the eyes, is to apply freely a solution of sugar.]

Abrasion of the cornea is sometimes produced by a scratch of the finger nail or by awkward attempts to remove a foreign body, or it is the result of a stroke with a twig or an ear of corn, an accident to which reapers are much exposed. A severe form of inflammation of the eye is often excited by such an abrasion.

In passing through a wood, a rebounding twig is apt to strike the eye. Even a slight stroke will sometimes occasion cataract or amaurosis.

Though recovery from the immediate effects of severe injury may take place, the eye is not yet quite safe, for after some weeks an internal inflammation may arise, not only of the injured but also of the uninjured eye.

This inflammation of the uninjured eye, called sympathetic ophthalmia, is very dangerous to the sight. Sympathetic ophthalmia having proved hitherto little amenable to treatment, the greatest attention should be paid to every case of ophthalmia from an injury, however slight apparently at first, in the hope of obviating an attack. And after the cessation of the inflammation in the injured eye, especial care should be taken by the patient not to use either eye much for a considerable time to come.

When a foreign body has got into the eye, prolonged attempts to remove it by an incompetent person should not be permitted; but the patient should forthwith obtain the assistance of a surgeon. In general, the foreign body may be at once discovered and removed with the greatest ease and with little or no pain. Scraping the cornea in attempts to remove a particle adhering to its surface is, as above mentioned, likely to excite a most dangerous inflammation of the eye.

Accidents often occur from arrows and other projectiles, with which boys play, striking the eyes. Such games should be prohibited where people are passing to and fro.

Prejudicial reaction of certain states of the Body on the Eyes.

Suppression of the perspiratory action of the skin is, as is well known, very dangerous to the health in general. It is so likewise to the sight. We ought, therefore, while perspiring, to guard against being chilled. The state of the skin, indeed, exerts as important an influence, for good or evil, on the eyes and sight as on any other organ and function of the body.

Amaurosis [obscuration; impairment or loss of vision from paralysis of the optic nervous apparatus] has been brought on by sudden suppression of perspiration of the feet, and it is not at all uncommon for persons when chilled to be seized with a catarrhal or rheumatic ophthalmia. If this occurs even to the healthiest, how much more readily will the eyes be affected when already predisposed either by natural delicacy, by previous over-exertion, by disordered digestion, &c.

In addition, therefore, to the great requisites for the preservation of the health of the eyes, as well as of the body, namely, wholesome and sufficient food (a person, it is to be remembered, may eat too little as well as too much,) with temperance in strong drinks, regularity of the bowels, exercise in the open air, a due amount of sleep (say eight hours,) attention to the state of the skin is of the utmost importance.

Sponging and rubbing the skin daily are always most beneficial, and when sufficient exercise in the open air cannot be had they are indispensable. Combined with proper clothing, flannel next the skin, and the outer garments adapted to the season, neither too thin in winter nor too thick in summer, friction of the skin renders us less susceptible to catarrhs, rheumatism, &c.

In persons advanced in life, with eyes already in a state of congestion, a chill is apt suddenly and dangerously to affect the sight. In such persons also, if they have been long troubled with bleeding piles, the suppression of the discharge is to be carefully guarded against, as further injury of the sight is very apt to follow.

Again, when, in consequence perhaps of costiveness, there is already a disposition to determination of blood to the head and eyes, the effort of straining at stool, especially in the case of old persons, is very apt to aggravate it and to injure the sight in various degrees even to amaurotic blindness.

Here it may be observed, in regard to straining at stool, that in consequence of a swollen and congested state of the lower end of the rectum, which often exists in costiveness, the feeling may be occasioned as if there was

something to be expelled, when in reality there is nothing. And so straining is unnecessarily and injuriously persisted in.

In making great bodily efforts, the blood may be so determined to the head and eyes that the pressure occasioned by the gorged blood-vessels on the retina will excite in the person the sensation as if light flashed from his eyes. And it is to be remembered that if a first effort does not produce permanent injury of sight, repeated efforts may.

In fits of sudden passion, blindness is apt to be occasioned by determination of blood to the head and eyes.

Exhaustion of the system from prolonged suckling is a not uncommon cause of injury to the sight. So also great loss of blood, venereal excesses, and the like.

Ophthalmia, or Inflammation of the Eyes.

The eyes are apt to be very materially injured in their structure by inflammation, and the sight correspondingly impaired or destroyed. The cornea may be left more or less opaque—the pupil closed or contracted—the retina more or less insensible to the impression of light.

Without having suffered such a degree of injury, the eyes may, nevertheless, be left, by repeated attacks of inflammation, so irritable as to be incapable of use.

How important, therefore, is it to prevent the occurrence of inflammation of the eyes, or to cure it speedily when it has occurred!

The practical advantage of being acquainted with the causes of inflammation of the eyes, is to know how to avoid them, and thus to prevent the inflammation; or if they have

already produced inflammation, to know how to remove them, if still in operation and removable.

The causes of inflammation of the eyes may be referred to three heads, viz.: 1st. Those which operate directly on the eye; 2d. Diseases of other parts with which the eyes sympathize, or which spread to the eyes; 3d. States of constitution and constitutional diseases which, though they do not necessarily determine inflammation of the eyes, at least predispose them to be affected by other causes, and modify inflammations thereby excited.

To the first head belong—injuries of the eye; exposure to wind and cold; direct action of very strong light, or of this and strong heat together; over-exertion of the sight, especially in bad light, either too weak or too strong, with much stooping of the head; the direct influence of acrid vapors and contaminated air; epidemic or endemic influences; the direct application of contagious matter.

These are all exciting causes, but some of them require to be assisted by other causes, so that they operate partly as predisposing causes also.

To the second head belong diseases of the skin; especially the exanthematous diseases, as smallpox, measles, scarlet fever.

To the third head belong scrofula, rheumatism, gout, and syphilis.

In the treatment of inflammation of the eyes, the first points to be attended to by the patient (besides, as a matter of course, the removal of the exciting cause, if still in operation and removable) are the protection of the eyes from everything which can cause or keep up irritation—such as using them or exposing them to strong light, and

the avoidance of whatever is calculated to operate injuriously on the system in general, such as exposure to the weather, excessive corporeal exertion, errors of diet, &c.

In some inflammations of the eye there is great intolerance of light; in other inflammations there is little or none at all. When the intolerance of light is great, the patient may be kept in darkness. But it is to be borne in mind that long exclusion of the light renders the eyes unduly sensitive. During convalescence, therefore, even though the eyes be still more or less impatient of the light, the room occupied by the patient should not be quite darkened. It will be sufficient to moderate the light by the blinds and curtains. Under such circumstances, a blue, green, or grey tint of the walls of the room best suits the eyes. Bright-colored objects should be removed from the room.

Use and abuse of Eye-waters, Salves, and Warm and Cold Applications to the Eyes.

It is a vulgar error, and a very serious one, to suppose that eye-waters or salves are the appropriate remedy for every disease of the eyes, no matter of what kind. In internal inflammations of the eyes, the common irritating eye-waters and salves are both useless and destructive; and this not only by the direct injury inflicted, but as leading to a neglect of the proper general treatment. In the mere superficial inflammations, on the contrary, more good is often effected by means of such applications than by any other kind of remedy.

There are two substances in very common use as ingre-

dients of eye-waters, viz., sugar of lead and lunar caustic, in regard to which a caution is necessary.

A solution of sugar of lead is a popular eye-water, and in certain cases it would be an useful enough application, if it had not the insuperable objection of leaving an opaque white deposit on the surface of the cornea, if abraded. This bad effect may result even from a single application, and cannot be prevented.

A solution of lunar caustic, again, dropped into the eye is, in numerous cases, a most valuable application, and, unlike sugar of lead, is not followed by any bad result if at all judiciously employed. But, it often happens, either from carelessness or ignorance, that the application is misused by being persisted in for a long time; the effect of which is, that the white of the eye and the inner surface of the lower eyelid are permanently dyed of a dark olive hue, or actually black, whilst the inflammation, for which the remedy was prescribed, is rendered chronic and incurable.

[It has been found that a solution of hyposulphite of soda, (gr. x. ad ʒi.) applied twice a day by means of an eye glass, will remove the discoloration of the conjunctiva by the nitrate of silver.]

In applying eye-waters, an eye-glass is not to be recommended. It is best to bathe the eyes simply by means of a bit of soft linen rag, taking care to let the eye-water run into the eyes, and, by moving the eyelids upwards and downwards, to bring it freely into contact with their inner surface.

Patients should not of their own accord use any application to their eyes but water. In regard to whether the

water should be cold or warm, it is to be observed that, in general, the cases in which cold water is best adapted are, certain superficial inflammations, floating muscæ and various irritable states of the eye; whilst, on the contrary, in all internal inflammations of the eyes, &c., warm water is preferable. No precise rule, however, can be laid down on the subject; but it may be observed that, in general, the feelings of the patient constitute a good guide for the choice.

Cold spring-water is the best cold lotion. It is applied by means of compresses of old linen or lint, which should be broad enough to extend over the neighboring parts as well as over the eye, but not so heavy as to press unpleasantly. When once commenced, the application of the cold lotion requires to be assiduously kept up as long as is necessary, one compress as soon as it becomes warm, being replaced by another just taken out of the water.

The *cold douche bath* consists in a fine stream of cold spring water, allowed to play on the closed eye and neighboring parts. Particular douche apparatuses are advertised and puffed, but the jetting of cold water on and into the eyes is, after all, little better than a mere bit of trifling.

In the weak and rheumy eyes of old persons, and in a similar state remaining after an attack of ophthalmia, it is often agreeable, and, indeed, productive of great relief, occasionally to draw some cold body across the eyelids. For this purpose a long slender bottle, with a smooth round bottom, filled with ice, has been recommended.

As warm applications to the eye, fomentations are much more convenient and elegant than poultices. Warm

water simply may be used for the purpose, or chamomile decoction, poppy decoction, and the like. The application is made by means of compresses, as just described for cold lotions. The application requires only to be made occasionally, and that merely for a period of from five minutes to a quarter of an hour at a time. Warm cataplasms and fomentations should never be allowed to become cold on the eyes. After their removal, the eyes are to be gently dried with a soft linen cloth, and care taken that they be not exposed to a draught of air.

Warm have the great advantage over cold applications, in that they leave the eyes, for some time after, pleasantly cool and soothed; whereas, if the cold application be intermitted, the increased heat in the eye which supervenes is most distressing.

PART II.

DEFECTS OF SIGHT IN PARTICULAR.

The diseased state of the eyeballs occasioning defective sight may consist, either in derangement of the dioptric apparatus in front of the retina, or in an affection of the retina itself, optic nerve, or brain.

In some cases, the derangement of the dioptric apparatus occasioning the defective sight complained of is very evident, consisting of opacity of the cornea, obstruction of the pupil, cataract, &c. In other cases, there is no defect of the eye perceptible to simple examination. Testing of the sight by glasses, &c., is then necessary to ascertain whether or not the defective sight be owing to derangement of the adjusting powers of the eye.

When it has been determined by direct exploration of the eyes, that the defective sight does not depend on opacity of the cornea, obstruction of the pupil, cataract, or the like, nor, by the tests just referred to, on deranged adjustment, then there is reason to fear an amaurotic affection, consisting in perverted, impaired, or lost sensibility, from disease implicating the retina, optic nerve, or brain.

There are cases, it should be observed, in which some defect both of the dioptric, and optic nervous apparatus exists.

But with eyes otherwise sound, there are cases of dis-

turbance of sight arising from loss of correspondence in the direction and movements of the two eyeballs.

Again, though there may be none of the defects above mentioned, and though the sight may be in reality quite good, it often happens that it cannot be properly exercised in consequence of some chronic inflammation or other disease of the accessory parts of the eyes, such as the eyelids or lachrymal organs.

These great classes of defective sight, though so different in their nature, are, in many of their kinds, species, and varieties, popularly confounded under the common name of *weak sight*.

CHAPTER I.

DEFECTIVE SIGHT DEPENDING ON DERANGEMENT OF THE DIOPTRIC APPARATUS OF THE EYES.

THE derangements of the dioptric apparatus of the eyes, it has been above stated, consist, some in opacity of the cornea, obstruction of the pupil, cataract, and the like, whereby the light is interrupted in its passage to the retina; others, in a want of adjustment.

Of the defects occasioning interruption of the passage of light to the retina, I pass over opacity of the cornea and obstruction of the pupil, which are effects of inflammation, and can be prevented only by preventing the occurrence of inflammation, or by quickly curing it, when it has occurred.

Here, I shall only speak of cataract—its nature, its cure by operation, and the question of its prevention or treatment without operation.

Cataract.

Cataract is manifested by a grayness or whiteness in the pupil, which is naturally of a clear black, and consists in a greater or less opacity of the crystalline lens, whereby the rays of light are, in a proportionate degree, intercepted on their way to the retina. The consequence is, that vision is more or less impaired, or even reduced to a perception of light and shade.

Different kinds of cataract are recognized by surgeons, and the distinction of one from the other is a point of no small importance, for on it depends a correct conception of the rise and progress of the disease, and, especially, the discrimination of the operative procedure best adapted to effect a restoration of sight in a given case.

Cataract, as above defined, is sometimes distinguished by the epithet *true*, into contradistinction to what has been called *false* cataract, which consists in opaque deposits of lymph, matter, blood, &c., on the crystalline body, obstructing the pupil—the consequence commonly of anterior internal inflammation of the eye neglected or mistreated. False cataract, however, may be combined with certain kinds of true cataract.

Relative frequency of Cataract at different periods of life.—

From	1	to	10	years	. . . . .		14
"	11		20	"	. . . . .		16
"	21		30	"	. . . . .		18
"	31		40	"	. . . . .		18
"	41		50	"	. . . . .		51
"	51		60	"	. . . . .		102
"	61		70	"	. . . . .		172
"	71	and	upwards		. . . .		109
							500

Lenticular cataract or opacity of the proper substance of the crystalline lens constitutes the typical example of cataract; and whilst it is the most common kind, it is fortunately that which admits of the most ready and perfect cure.

In older persons, the opaque lens is hard; in younger persons, soft.

Hard or Common Lenticular Cataract of old persons.

From fifty years old, and upwards, is the age of the majority of persons, it will be seen from the above table, who present themselves with cataract, and in them the cataract is usually more or less harder than the lens naturally is.

When the cataract is pretty fully formed, every thing right before the patient generally appears to him as if obscured by a thick cloud or gauze. In bright light, which causes the pupil to contract, vision is still more indistinct; in moderate dull light, which allows the pupil to dilate, it is less so. The opposite of this, however, sometimes occurs, viz., that the patient sees as well in a strong, as in a dull light, sometimes better. Lastly, objects may not be seen at all; but vision may be reduced to a mere perception of light and shade.

The peculiarities in the state of vision now enumerated, present themselves according as the opacity is greater or less in the centre opposite the pupil, than at the circumference of the lens, or as it is equally great in the centre, and at the circumference.

When the pupil is dilated by belladonna, or its active principle, atropia, vision is still more decidedly improved, as the dilatation produced is greater than that which takes place in dull light.

The dimness of sight and opacity in the pupil, in general, begin in a very unmarked manner, and increase slowly, for perhaps months or years, until they have attained the degree above described. Usually, one eye is affected first, and by and by the other. In rarer cases, both eyes become equally affected at the same time.

Lenticular cataract of old people consists in a shriveling of the fibres, and a granular state of the interfibrous mate-

rial of the proper substance of the lens. It may be looked upon in some degree as a natural change with the advance of life, analogous to the hairs becoming gray or white. But there are some circumstances which especially predispose to the complaint, such as hereditary tendency, rheumatic constitution, habitual exposure to strong fires, &c.

When once begun to form, it may be prognosticated, that the opacity will go on to increase until all useful vision is prevented in the eye. And it may also be prognosticated, that the other eye, if not already affected, will become so likewise. How rapid or how slow the progress to loss of useful vision may be, cannot, however, be prognosticated—it may be months, or it may be years.

Restoration of vision can be effected only by an operation, by which the opaque lens shall be removed from its situation to below the level of the pupil, (*the operation of displacement,*) or extracted from the eye altogether, (*the operation of extraction.*) [In this city the operation by division or absorption is generally preferred, being well adapted to the removal of soft or fluid cataract.]

These operations have for their common object the removal of the opaque body from behind the pupil, so that the rays of light may be again allowed to pass on to the retina.

To make up for the loss of the crystalline lens, the use of spectacles, with strong convex glasses, is required after recovery from the operation.

In cases fit for the operation, a successful result may be expected in a large majority. Perhaps, out of twelve cases operated on, excellent sight may be recovered in eight, less good sight in two or three, whilst one or two will prove unsuccessful.

When in one eye useful vision is lost, and in the other, vision has become dim from cataract, it is advisable to operate as soon as possible on the blind eye, in order, that this may be fully recovered by the time the opposite eye is so blind as to require the operation.

When in an elderly person, double lenticular cataract has become so far developed as to interfere with useful vision, the operation should be had recourse to as soon as possible, if extraction is the operation to be performed, for there is more chance of a successful result than at a later period; if, on the contrary, displacement is to be performed, the operation may be delayed, if the patient prefers it, without disadvantage.

When cataract is fully formed in both eyes, both may be operated on at the same time, though it is better to operate on one only at a time, if extraction, and on both, if displacement, be the operation to be performed.

The older surgeons laid great weight on what they called *ripe* and *unripe* cataracts—that is, cataracts fit for operation, and cataracts not yet fit. And among non-medical people the distinction is still talked of.

It was supposed that the opacity depended on the coagulation of a fluid; and until this process was judged to be sufficiently advanced to permit of the concretion being displaced by the needle, the cataract was deemed unripe. This was an erroneous notion of the nature of the disease; but the practice recommended was in some degree founded on a pathological fact, not however understood.

The operation, in reference to which the distinction of ripe and unripe was made, was couching or depressing the cataract. Now, in the cataract of old people, when the opacity of the lens is fully formed, there is, at the same

time, softening of the vitreous humor, and the connections and bands by which the lens is held in its place are so loosened, that it is easy with the cataract needle to depress the lens, by tearing the loosened connections and bands, into the softened vitreous humor.

In an early stage of the cataract, the connections of the lens are still firm and the vitreous humor unsoftened, so that the opaque lens does not admit of being so easily depressed, and if forced down it is apt again to rise. This constitutes unripeness of the cataract.

Ripeness and unripeness of the cataract has no bearing on the operation of extraction, unless it be in a contrary sense; for when the cataract is very ripe for couching, the case is not very safe for extraction on account of the softened state of the vitreous humor; whereas, when the cataract is as yet unripe for couching, the eye is in the fittest state for extraction. Hence it is advisable, if the operation of extraction is to be performed, to operate as soon as the dimness of sight is such as to call for interference.

Preparation of the Patient for undergoing an Operation for Cataract.—If the case be free from local or constitutional complications, the patient requires no other preparation than a few days' rest of mind and body, some attention to diet, and to the state of the bowels. If, on the contrary, any such complications exist, he ought, before the operation is undertaken, to be subjected to such treatment as is adapted either to remove them altogether, or to palliate them so far as to remove or diminish the risk of their interfering to prevent the success of the operation. The previous habits of the patient as to diet, the use of strong drinks, smoking, &c., should be carefully considered.

In very timid patients chloroform may be occasionally

resorted to, at least in operations with the needle. [A mixture of one part of pure chloroform with three or four parts of sulphuric ether, is preferred to either chloroform or sulphuric ether alone.] The vomiting which is apt to supervene is a strong objection to its employment in extraction.

Seasons of the year best adapted for Operations for Cataract.—Operations for cataract may be performed during mild and steady weather at any season; and such weather usually occurs from March to the end of October.

Position of the Patient.—The patient may either sit on a chair, or lie extended on a sofa or table with a pillow under his head.

In operating on the eye, it is of the greatest moment to have good light. A window directed to the north should, if possible, be chosen. If there be more than one window in the room, the others should have the curtains drawn.

Opening and securing of the eyelids.—The patient, assistant, and operator being in their places, the next business is to open and secure the eyelids. The proper securing of the eyelids is a most important point. As some uneasiness attends this, the patient is apt to flinch at it. It is, therefore, advisable to accustom the patient to the necessary handling of the eyelids in opening and securing them by practising the manipulation daily for two or three days before the operation, the patient being at the same time seated as it is proposed he should be at the time when the operation is actually performed.

Extraction of the Cataract.

In the common hard lenticular cataract of old persons, the operation it is most advisable to perform, when circum-

stances admit of it, is extraction through an incision in the cornea.

The operation is a nice and difficult, though not painful one, and for its success an otherwise healthy condition of the eye is of great importance. Steadiness on the part of the patient during the operation diminishes to the surgeon the difficulties attending its performance, whilst after the operation, it is calculated to promote the healing process, and to ward off the occurrence of such accidents as are apt to interfere with that process, and so mar success. On the other hand, among the conditions unfavorable to, or wholly forbidding the performance of the operation, is restlessness on the part of the patient, chronic cough, and difficulty of breathing.

When the case is one of common hard lenticular cataract, and when the other conditions are favorable, the prognosis is good. Recovery of the eye from the effects of the operation sometimes takes place in less than three weeks; but not unfrequently some degree of external, or even anterior internal inflammation occurs, so that recovery is retarded. In general, convalescence should not be calculated on sooner than from four to six weeks. Sometimes, although the case appeared to be in all respects a proper one, and the operation well and successfully performed, the healing process does not proceed favorably, and sight is not restored.

The operation having succeeded as an operation, more perfect vision is in general obtained after extraction than after any other mode of operating.

The operation of extracting a lenticular cataract, through an incision in the cornea, may be viewed as comprehending two principal steps, viz., 1st, *the section of the cornea;* and,

2d, *the laceration of the capsule, and extraction of the lens.*

The mode in which the section of the cornea is made, is to pierce through the cornea on the temporal side into the anterior chamber, which constitutes the act of *puncturation;* then to push the point of the knife, the flat surfaces

of the blade being to and from the operator, through the anterior chamber, across to the nasal side of the cornea, where the point of the knife is again made to pierce through the cornea from the anterior chamber, an act called *counter-puncturation.* By now continuing to push the knife onwards, it, by its increasing breadth, *cuts itself out* in the direction of the dotted line (fig. p. 45) and so the section of the cornea is completed. The section of the cornea thus comprehends three acts, viz., *puncturation*, *counter-puncturation*, and *cutting out.*

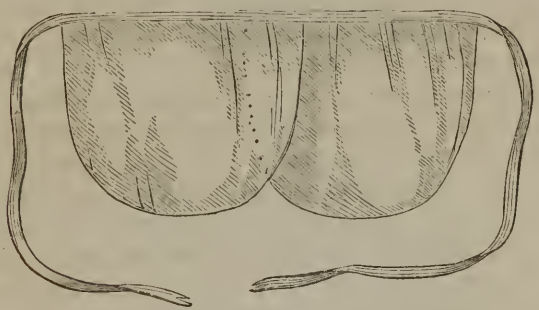
In its natural state, the capsule, when punctured merely, will readily tear and allow the lens to escape; and although in lenticular cataract the same thing will often happen, it is proper not to trust to this, but to take pains to lacerate the anterior wall of the capsule freely.

It often happens that immediately on the laceration of the capsule, the lens begins to escape; if it does so, the surgeon at once proceeds to help it out; but if it does not, the eyelids are allowed to fall together for a minute or so before the extraction is proceeded with.

The lens having been extracted, the eyelids are again al-

lowed to close. And, after a minute's rest to the patient, the surgeon gently opens them to see if the iris and flap of the cornea are in their proper position. If the iris and pupil do not appear to be quite right, the upper eyelid is allowed to close, and is to be rubbed gently with the finger over the front of the eyeball, and then quickly opened to the light, when the iris will contract, and will thus, along with the pupil, be brought into a proper situation. This being the case, and the flap of the cornea in accurate apposition, the eyelids are to be closed, first the upper and then the lower.

After the operation, both eyes are to be kept closed, and for this purpose a narrow strip of court plaster, extending from the eyebrow to the cheek, is to be applied over the eyelids on each side; whilst over all, is placed a shade composed of a fold of soft linen, to which is fixed a tape to tie round the head, thus,



Another method of bandaging is, to lay over the eyes, when closed, a light fold of linen, and secure it by a band, the middle of which is laid over the nape of the neck, and

the ends brought round over the eyes, crossed on the forehead, and pinned to each other behind.

The patient need not be put to bed immediately after the operation, unless he desires it, but may recline on an easy chair or sofa, until about his usual bed-time. The room should be somewhat darkened, and perfect quietness observed in the house. The patient should refrain from speaking, and endeavor to keep himself as composed as possible. His food should be so prepared as not to require much chewing.

At bed-time an opiate should not be omitted, if the patient is in the habit of taking one to procure sleep; if not in the habit, an opiate is to be given only if the patient be restless.

During the night, the patient requires to be watched, lest by turning in bed or rubbing the eye with his hand while asleep, the eye should be injured. A good precaution is to secure the patient's hands to his side, so far that they may be prevented from being carried to the eye.

The patient should not go to stool for the next day or two succeeding the operation, if this can be avoided. If not, he ought to bear well in mind to move with the greatest caution, and that he must not make the slightest straining effort. Irremediable injury to the eye, by protrusion of the iris, &c, has been the result of such want of care. After forty-eight hours some laxative medicine may be taken.

The patient should lie on his back, or on the side opposite that on which the operation has been performed, until at least the third day, when, if matters go on well, he may sit up in bed. On the fourth day, he may be allowed to get out of bed for a few hours in the afternoon.

During the twenty-four or forty-eight hours succeeding extraction, the patient feels as if he had received a blow on the eye, and also from time to time experiences a slight smarting and pressing sensation, which is always relieved when a watery fluid escapes from the eye. From this and encrusted Meibomian secretion, the eye is to be from time to time carefully cleansed with tepid water and a soft linen rag. The eye is not to be opened until the third, fourth, or fifth day, but that things are going on well may be inferred if there is no pain, and the upper eyelid neither red nor swollen. On the third or fourth day, after the borders of the eyelids have been cleansed from any adherent matter, by means of tepid water and a bit of soft lint, as just mentioned, and the strips of black court plaster, if they have been used, removed, the eye may be opened and looked at, but closed again, and so on from day to day, until the ninth or tenth. After that, the eyes being protected by a shade, the patient may freely open them.

The corneal incision heals in the course of two or three days, or even sooner, if there is nothing to prevent union by the first intention, such as prolapse of the iris, with or without prolapse of the vitreous body, or non-apposition of the edges of the incision. The incision, when enlarged by scissors, is apt not to heal completely by the first intention.

Untoward occurrences during the operation.—Protrusion of the iris may take place on the completion of the section of the cornea, and again after the lens has been extracted. But if uncomplicated with escape or protrusion of vitreous humor, the protruded iris is in general easily replaced. The protrusion of the iris, which is apt to occur subsequently, is much more to be dreaded.

When the vitreous body is of its natural consistence, and its connections unweakened, as in young persons, there is little danger of its escape. With the advance of age, however, softening of the vitreous body and its connections, as above observed, tends to take place; hence it is that in the operation at present under consideration, viz., extraction of the common hard lenticular cataract of old persons, bursting out of the vitreous humor, with or without the lens, is apt to occur.

In a case of bursting out of the lens, together with a greater or less quantity of vitreous humor immediately on completing the section of the cornea, the operation is completed, and whether it is likely to be followed by a good or bad result will, in a great measure, depend on the quantity of vitreous humor lost. If the quantity does not exceed one fourth, it is possible for the eye to recover with pretty good vision; if more is lost, such an event is not to be hoped for.

In any case, the mode of procedure is to close the eyelids immediately, and leave things to nature. Under the most favorable circumstances, the wound of the cornea heals slowly, and the pupil is dislocated towards the cicatrix. Still, good vision may be restored.

Should the vitreous humor begin to escape without the lens, the small hook is immediately to be introduced, and the cataract hooked by its lower edge, and brought out as quickly as possible.

Untoward occurrences after the operation.—Though the cataract have been extracted without accident, and though when the eye is bound up everything appears right, untoward occurrences may yet take place. Inflammation, both

external and anterior-internal, acute or slow, may arise; in either case impeding the union of the corneal incision and disposing to protrusion of the iris.

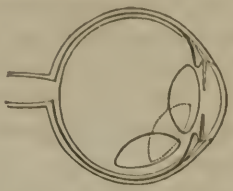
It has been above stated that protrusion of the iris is apt to take place at the time of the operation; but though such has not occurred, the eye is not yet safe from that accident, for in the course of the three or four days following the operation, the iris may yet protrude. This secondary protrusion of the iris may be occasioned by some such effort as straining at stool, or coughing, but it is generally owing to non-union of the corneal incision, and swelling of the iris, occasioned by supervening inflammation, or by extravasation of blood.

Nothing should, in general, be done directly. If the protruded iris be large and appear to be much distended by fluid behind, the propriety of puncturing it, or even snipping it off, may come to be a question. As the inflammation subsides, the protrusion sinks, and the iris will be involved in the cicatrice of the cornea, which will be broad and unsightly, whilst the pupil will be displaced and contracted, or altogether closed. By and by, touching the protruded iris once a day or every second day with the nitrate of silver pencil, will promote cicatrization. This may even be done from the first, if, instead of inflammation, there is defective action in the part.

Displacement of the Cataract.

There are two modifications of the operation of displacement, viz., *couching* or *simple depression, and reclination*. In the one case the displaced lens has its anterior surface downwards and somewhat forwards,—its posterior surface,

upwards and somewhat backwards,—its superior edge forwards and somewhat upwards,—its lower backwards and somewhat downwards, thus:



In the other case, the displaced lens has, at the same time that it was depressed, been made to turn back on its lower and outer margin, so that, its upper edge being forced back into the vitreous humor, its anterior surface comes to be uppermost, its posterior surface directed downwards, thus:

Both couching and reclination of the cataract are usually effected by introducing the cataract-needle through the sclerotica, that is, by *sclerotic puncturation.*

Reclination effecting all that couching can, and being in every respect a better operation, couching has altogether fallen into disuse.

The kind of cataract best fitted for displacement is the same as that best fitted for extraction. Whether or not therefore displacement should be performed instead of extraction will depend upon the absence of the conditions

necessary for, or at least favorable to the successful performance of extraction or the existence of the conditions unfavorable to, or wholly forbidding it.

The displaced lens, if disengaged from its capsule may eventually disappear, or be reduced to a small size by solution and absorption, especially in persons of less advanced age—say about fifty—and when the cataract is not very hard. In many cases, however, it does not dissolve, and is always apt to rise again.

The light fold of linen, to hang over both eyes, is sufficient bandage. In other respects the same general management is to be adopted as above recommended after extraction.

In the course of a few hours after the operation, vomiting sometimes occurs. Reascension of the lens may be thereby occasioned.

Acute internal inflammation of the eye is apt to be excited by the operation. Most frequently, however, the supervening inflammation is of a chronic character, ending in disorganization of the eye and loss of vision.

Soft or common lenticular Cataract of young people.

This cataract is of the same consistence as that which is natural to the lens, or softer, and of a grayish white, or milk and water opacity.

Vision is diminished in proportion to the opacity, in a manner analogous to what is above described to be the case in hard cataract.

The occurrence of opacity of the lens in young persons is very much rarer than in old persons. It is often met with as the result of injury. In children affected with

lenticular cataract, we are sometimes told that the opacity made its appearance after convulsions. In other cases it cannot be traced to any cause. Frequently, it is congenital.

It is to be remembered that this form of cataract is not unfrequently complicated with amaurosis.

The kind of operation best adapted for the removal of soft lenticular cataract is that by *division*, in order to its solution and absorption.

Division of the Cataract.

The object of this operation is to lacerate the capsule and break up the lens, so that the latter, being freely exposed to the action of the aqueous humor, may be gradually dissolved and absorbed, and thus altogether removed from the eye.

Considered as an operation, division is the most simple of all those for cataract, both in performance and in the extent of injury necessarily inflicted on the eye.

In the cases proper for the operation, the prognosis is good. There is in general little inflammatory re-action, but though the lens may be perfectly absorbed, the capsule, which does not admit of solution and absorption, if not already opaque may become so, and form what is called *secondary capsular cataract*. To anticipate this, the anterior wall of the capsule should, during the first operation, be as completely cut up as possible at the part corresponding to the pupil. The rapidity with which solution and absorption go on varies from a few days to several months. In general it may be said that in children the absorption proceeds more quickly than in adults.

One operation may suffice; but, generally, solution proceeding slowly, the operation requires to be repeated, and that more than once. This, as the operation is so simple and painless, is no great objection. The interval between the repetitions of the operation should be about six weeks.

It is best to operate on both eyes at the same time. I have observed that solution proceeds more quickly after the operation on both eyes at the same time than after the operation on one eye only. When the eye becomes inflamed, solution appears to be arrested.

If the retina was previously quite sound, a perfect restoration of vision may be calculated on, if solution and absorption go on pretty quickly; if not, by the time the cataract disappears, the sensibility of the retina may be found impaired.

The treatment after division is the same in general as after displacement, except that the pupil is to be kept dilated.

Secondary Cataract.

After the operation of extraction, some portion of the cataractous lens may remain obstructing the pupil, forming what is called *secondary lenticular cataract.* In such a case no interference is in general required, the lenticular fragments being eventually absorbed. The posterior strata of the lens, both opaque and firm, sometimes remain adhering to the posterior wall of the capsule, and show little disposition to become absorbed. In such a case I have found it necessary to have recourse to the operation of division some months after the extraction had been performed.

After the operation of extraction of the lens, but espe-

cially after division, the capsule is apt to become opaque and obstruct the pupil. This forms secondary *capsular* cataract. The operative procedure for secondary capsular cataract depends on the particular circumstances of each individual case.

Comparative advantages and disadvantages of Extraction, Displacement, and Division.

By the operation of extraction, the cataract is removed wholly and at once from the eye, and very good vision restored; but the operation is a nice, if not a very difficult one, and liable to the occurrence of the various untoward circumstances above mentioned, by which its success may be marred.

The operation of displacement, which may be performed in the same cases as extraction, is neither so nice nor so difficult an operation, and does not expose the eye to the same immediate risks; the cataract is, indeed, apt to return to its former place, but the operation may be repeated. After displacement, however, though the operation may have succeeded, and vision be restored, the eye is not so safe as after successful extraction; but, as above mentioned, is liable to become affected with internal inflammation, which may end in blindness.

Extraction thus possesses a decided advantage over displacement, and is therefore generally preferred, except when the unfavorable complications, above mentioned, exist.

The degree of softening of the vitreous body requisite to admit of safe displacement of the lens is not so great as to forbid extraction; but, of course, if in the cases in which the vitreous body is so much dissolved that the displaced

lens is apt to float up again, displacement be contra-indicated, extraction is much more so.

All other things being equal, it might, perhaps, be laid down as a general proposition that in the very cases in which displacement admits of being most readily and safely performed, extraction is less safe, whilst, on the other hand, in the cases in which, in consequence of the soundness of the vitreous body, extraction is most safely and easily performed, displacement is least so.

As the cases for which division is best fitted are different from those in which extraction or displacement is indicated, there is no comparison to be made between them.

Palliative treatment of Cataract. Can Cataract be cured without an Operation?

In many cases cataractous patients have their sight temporarily improved by dilating the pupil with belladonna or atropia. Some, however, are dazzled by this. And in some, though benefit is obtained, congestion of the eye is induced.

There have been, and there are at the present time, persons who pretend to cure cataract without an operation; and witnesses to their skill are not wanting, either in persons who allege to have been themselves thus cured of cataract, or in persons who aver that they are acquainted with those who have been thus happily restored to sight.

On the other hand, all medical men of reputation and experience in the treatment of the diseases of the eye, affirm that they have never known a case in which true cataract, when once formed, has been cured without operation, that is, in which the lens, having once become opaque, has been

again rendered transparent, or at least been removed, either by the efforts of nature or by any kind of medical treatment.

In corroboration of this, I have to add my testimony, and at the same time declare my belief, that the allegations that cataract has been cured without an operation are some of them false, whilst others are founded on ignorance and mistake as to the nature of the cases treated as cataract.

Persons, by applying belladonna to the really cataractous eye and thereby dilating the pupil, have improved the sight for a time, and have called this *curing* cataract without an operation.

Another trick has been to puncture the eye and lacerate the capsule with a fine needle without the patient's knowledge, and to continue various applications, whilst all the time the cataract was disappearing by absorption in consequence of the operation of division thus clandestinely performed.

Again, specks of the cornea have been called cataract, and as these frequently admit of being removed by treatment, the case has been put down as cataract cured.

Lymph in the pupil from iritis is known under the name of false cataract. Being removed by absorption, as it sometimes is, and the sight improved, this also has been put down as cataract cured without operation.

There are cases, again, in which the lens may be really somewhat opaque or cataractous, but not sufficient in itself to interfere very materially with the sight, and in which, from congestion of the eye, the sight has become impaired. Now, treatment in such cases often has the effect of removing the congestion, and thereby improving the sight. This is then held up as an indubitable case of cataract cured without an operation, whereas the cataractous opacity of the

lens remains undiminished and will go on slowly to increase as usual, and eventually obscure the sight in spite of all treatment.

There are other cases again in which there is an appearance of dimness of the lens, but not true cataractous dimness, though it is liable to be mistaken for such by medical men not much conversant with diseases of the eye. Along with this dimness in the pupil there is impaired sight, not from the dimness of the lens but from impaired sensibility of the retina. The sight in such cases being sometimes capable of more or less temporary improvement by treatment, such as counter-irritation, this improvement is held up as an example of the cure of cataract without operation. In such cases, however, sight eventually becomes more and more impaired, or actually lost.

By a blow on the eye, the capsule of the lens is sometimes burst. The immediate effect of this is cataract, but gradually, by the solvent action of the aqueous humor, the opaque lens is dissolved, and eventually removed by absorption. The cataract is in this manner cured by the efforts of nature, not, however, without an operation, for the injury causing the capsule to burst was an operation—the same as that which surgeons call the operation of division. In short, the injury was at once both bane and antidote.

It is thus evident, that there is full scope for imposition in respect to the curability of cataract without operation, especially as there are so many people ready and willing to believe in it, and to believe even still more unfounded pretensions.

Mydriasis or simple fixed Dilatation of the Pupil.

The pupil is, in ordinary light, of its medium size, which is about one fifth of an inch in diameter. When the light to which the eye is exposed is strong, the pupil becomes contracted to a smaller size; but, on the contrary, when the light is very dull, it is dilated to a larger size.

Dilatation of the pupil, persisting in opposition to the influences to which the pupil is ordinarily obedient, sometimes occurs, unaccompanied by any other defect of sight than may be accounted for by such a derangement of the optical adjustment of the eye.

That the case is of this simple nature, and not one of that serious disease of the sight—amaurosis (of which dilatation of the pupil is a pretty common symptom,) is ascertained if the patient, on looking through an aperture in a card of less than the ordinary size of the pupil, is able to see objects quite distinctly.

Not the less, however, should the patient take advice on his case, for the dilatation is apt to persist, and the sight become more impaired.

Myopia, or Short-sightedness, Presbyopia, or Far-sightedness, &c.

When the distance at which an ordinary sized type can be read *comfortably*, is much less than twelve inches, the vision is said to be myopic, or short; when, on the contrary, it is much greater, vision is said to be presbyopic, or long.

Preparatory to entering on an account of short-sightedness and far-sightedness, it will be useful to make some ob-

servations on refraction by convergent lenses, and on the adjustment of the eye to different distances.

Refraction by convergent lenses and the adjustment of the eye to different distances.

The rays of light from very distant objects, though not strictly parallel, are usually assumed to be so. The focus to which such rays are brought by a convergent lens, is called the *principal focus of the lens.*

If rays do not come from such a distant body as to be parallel, but are more or less divergent, then the focus to which they are brought by the lens, is farther off from the lens than its principal focus, viz., at some point between this and infinite distance. This point is nearer the principal focus the more distant the body whence the rays emanated; in other words, the more nearly parallel they are, and *vice versâ.*

The point of an object from which any given pencil of divergent rays emanates, is named the focus of incident rays, and the focus to which these divergent incident rays are brought by the lens is named the focus of refracted rays. These two foci, the focus of incident rays, and the focus of refracted rays, in consequence of the relation between them above pointed out, viz., that when the one is near, the other is distant from the lens, are named *conjugate foci.*

From this it will be perceived, that if the refractive media of the eye were incapable of change, either as regards power, or as regards their relative position to the retina, the rays of light from objects at one particular distance only, would be collected into foci on the retina. Rays

from objects farther from the eye than that distance would come to foci, before arriving at the retina, and having crossed, would fall in a scattered state on the retina, or, as it is called, in circles of dissipation. Rays from objects nearer would not come to foci, except behind the retina, on which therefore they would fall likewise in a scattered state (see figs. pp. 72 and 78.)

The result of this would be, that objects could be seen perfectly distinctly only when situated at one particular distance from the eye. But we know that this is not the case. We know that we can see objects *perfectly* distinctly at different distances, within certain limits. Hence the eye must admit of adjustment to different distances, like our optical instruments.

Here the distinction is to be explained between perfect and distinct vision. In perfect vision, the outline, color, and details of the object appear traced with the utmost accuracy, clearness, and strength; and this we have only when the rays of light are brought accurately to foci on the retina. In distinct vision, larger objects are seen so well, that they are readily recognized; the title-page of a book, for example, is easily read, but there is a want of clearness of outline and strength of tint, and small objects or the details of large objects are very imperfectly recognized; this is owing to the rays of light not falling on the retina in exact foci, but in small circles of dissipation.

The limits within which the eye can see perfectly distinctly at different distances, in other words, the limits of perfect vision, varies somewhat in different persons, and even in the two eyes of the same person; but in general they may be put down at between nine and fifteen inches.

For some distance below nine, or above fifteen inches, the vision may be still distinct, but not perfect.

Though there can be no doubt that the eye is capable of adjustment for vision at different distances, the means by which this is effected have not been unequivocally demonstrated; still, as the power of adjustment is lost with the crystalline body, it is very probable that it depends on a change in the position and form of the lens. By a very slight movement of the lens forward, and a very slight increase of its curvature, the eye could be adjusted for near distances, and *vice versâ.*

When the eye is adjusted for near objects, the pupil is contracted, and the axes of the eyeballs converged, and *vice versâ;* but these variations in the size of the pupil and direction of the eyeballs, are merely a concomitant and auxiliary, not an essential condition.

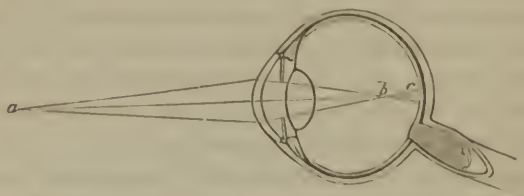
With a contracted pupil, or by looking through a small aperture, a presbyopic eye can see near objects, and a myopic eye, distant objects more distinctly. This is owing to the exclusion of the extreme circumferential rays of the cones of light which enter the eye, and the consequent diminution of the circles of dissipation on the retina.

Short-sightedness.

This is that state of vision in which the person can see objects perfectly distinctly only when they are at shorter distances from the eyes, than the average above stated.

It is owing either to too great power of the refractive media of the eye, or to the distance of the retina behind the crystalline being too great; so that in either case, the rays of light come to a focus before arriving at the retina,

cross and are in a state of dissipation, when they do impinge on that nervous membrane, and therefore form indistinct and confused images.



a, Focus of incident rays; *b*, focus of refracted rays falling in front of the retina; *c*, the rays impinging on the retina, in a scattered state.

By bringing the object near, it is distinctly seen, because the rays of light from it, which enter the eyes, being now more divergent than when it was distant, are not so soon brought to a focus; in other words, the different points of the object, as foci of incident rays, and the foci to which these rays are brought in the interior of the eye by the refractive media, are *conjugate foci*, and accordingly, when the foci of incident rays are brought nearer the refractive media, the foci of refracted rays recede from them.

Too great a refractive power of the media of the eye, may be owing either to too great convexity of their curvatures,—the curvatures of the cornea and crystalline,—or too great refractive density, or both conjointly.

The situation of the retina at too great a distance behind the crystalline body, may be owing either to a preternatural elongation of the axis of the eyeball, or to the lens being nearer the cornea than usual.

In short-sightedness, the power of adjusting the eye to different distances, is still retained, but within certain

limits, thus, the nearest distance may be from two to four inches, the furthest, from six to twelve.

In many cases, there are no peculiar appearances presented by the eyes of myopic persons; but frequently the eyes are prominent and firm, the cornea very convex, the anterior chamber deep, and the pupil dilated.

Short-sighted people see small objects more distinctly than other people, because from their nearness the objects are viewed under a larger visual angle.

They see them also with a weaker light, because the objects being near, a greater quantity of rays from them arrive at the eye. Hence, they can read small print with a weak light.

But they can also see more distinctly, and somewhat further off by a strong light than by a weaker one, because the pupil is contracted by the strong light, and all but the more direct rays of light thereby excluded. On the same principle they see at some distance distinctly through a pinhole in a card; and when they try to view distant objects, they half close their eyelids. The rays of light in these cases have their divergence at the same time somewhat increased by diffraction.

They sometimes see objects beyond the limits of their distinct vision, double, or even multiplied.

Short-sightedness seldom occurs in so great a degree before puberty as to be troublesome; when in a great degree in children it may be a symptom of central cataract. After puberty, when the eyes come to be used in earnest, this defect of sight is usually first discovered to exist, and it may go on gradually increasing, especially if the person uses his eyes much in reading, and on minute objects; hence, the

greater frequency of short-sightedness among the educated classes, and those whose occupation is with minute work. Myopia does not always diminish with years. We meet with persons of the most advanced age who still find it necessary to use glasses as deeply concave, as they did in youth, if not more so. Nay, short-sightedness sometimes occurs in old persons, whose vision was previously good for ordinary distances.

The true or optical short-sightedness under consideration, requires to be distinguished from that short-sightedness which depends on defective sensibility of the retina. In this latter form, which may be named *nervous short-sightedness*, although objects are seen better near at hand, they are not seen distinctly, as in true short-sightedness; and help is obtained from convex instead of concave glasses.

In nervous short-sightedness near objects are, as above said, seen better, because more light being received into the eye from them, a stronger impression is made on the retina. On the same principle, convex glasses help the sight, and that for distant as well as near objects, by concentrating the light. On the same principle also, well illuminated objects are seen better.

An analogous form of short-sightedness is occasioned by impaired transparency of the lens.

To persons whose occupation is with minute objects, short-sightedness, unless in a very great degree, is rather an advantage, as they are enabled to observe all the details of their work very accurately; and in the ordinary exercise of vision, the use of concave glasses is a ready and simple help.

When a tendency to short-sightedness manifests itself

in youth, and especially if the future occupation of the person is to be of a kind requiring good vision for distant objects, much exertion of the eyes on minute work should be avoided, and the eyes frequently exercised on scenes in the open country.

Concave glasses help the vision of short-sighted persons for distant objects, simply by increasing the divergence of the rays of light before they enter the eye, so that they may be less speedily brought to foci than they would otherwise be, in consequence of the increased refractive power of the media of the eye; or, supposing the refractive power of the media of the eye not increased, but the distance of the retina behind the lens increased, that they may be brought to foci at a greater distance behind the lens than they would otherwise be, in order to correspond with the greater distance of the retina behind the lens.

Concave glasses are made of different degrees of concavity, the shallower being those adapted for the slighter degrees of short-sightedness, the more concave for the greater degrees.

When very short-sighted, a person requires to use concave glasses, not only to be enabled to see distant objects, but also for reading with, in order to avoid the necessity of stooping. For the latter purpose shallower glasses suffice. Less short-sighted people use glasses only to be enabled to see distant objects.

The focal length of the concave glass which a person will require to see objects at more than two or three hundred yards distance, should be about equal to the distance at which he can see to read distinctly an ordinary type with the naked eye,—six inches for example.

The focal length of the concave glass which a very short-sighted person will require to see to read with at a convenient distance, is determined thus:—Suppose he sees to read with the naked eye at the distance of six inches, and desires to be able to read at the distance of twelve, the one distance is to be multiplied by the other, and the product seventy-two, divided by the difference between the two distances, viz., six. The quotient twelve, is the number of inches the focal length of the glass required should be.

But when a person finds it necessary to have recourse to glasses for short-sightedness, he should go to an optician, and select two or three pairs which appear to assist his vision best; or send for two or three pairs of about the focal length, which according to the above calculation he thinks will suit him, and try them leisurely at home for a day or two before fixing his choice on one particular pair.

The following are the circumstances which should guide him in his choice—

The glasses should be of the lowest power which will enable him to distinguish objects as he wishes, quite readily and clearly, and at the same time comfortably If they should make objects appear small and very bright, and if in using them the person feel his eyes strained and fatigued, or if he becomes dizzy, and if after putting them aside the vision is very confused, they are not fit for his purpose—they are too concave.

Having once fitted himself, a person should not too hastily change his glasses, although they may appear not to enable him to see quite so clearly as when he first began to use them.

A glass to each eye should always be employed; vision is by this clearer, and its exercise less fatiguing than when

a glass to one eye only is used. The use of a glass to one eye only is, in fact, very detrimental, especially to the opposite eye.

When, as is sometimes the case, the eyelids of short-sighted people are tender and irritable, the sight should not be much used in reading or sewing. In such cases, it is useful occasionally to bathe the eye-brows and temples with some cooling lotion.

Far-sightedness.

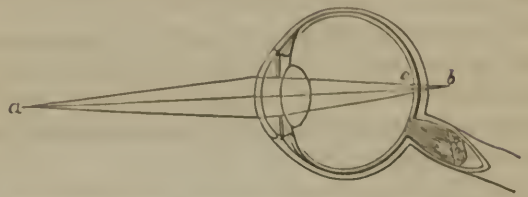
With this state of vision the person can see objects distinctly only when they are at a very considerable distance from the eyes; in reading, for example, he holds the book at arm's length.

Far-sightedness being in almost all respects the converse of short-sightedness, the best way of discussing it here will be simply to reverse the account above given of short-sightedness, and which will therefore stand thus—

Far-sightedness is owing either to diminished power of the refractive media of the eyes, or to the distance of the retina behind the crystalline body being too short; so that in either case the rays of light tend to come to a focus at a point behind the retina, on which therefore they impinge in a scattered state, and form indistinct and confused images.

By removing the object from the eyes, it comes to be distinctly seen, because the rays from it which enter the eye, being now less divergent than when it was near, are more quickly brought to a focus; in other words, the different points of the object as foci of incident rays, and the foci to which these rays are brought by the refractive media are *conjugate foci;* and accordingly, when the foci of

incident rays are removed from the refractive media, the foci of refracted rays come nearer them.



a, Focus of incident rays; *b*, focus of refracted rays falling behind the retina; *c*, the rays in a scattered state, as they impinge on the retina.

Diminished refractive power of the media of the eye may be owing to diminution of the convexity of their curvatures, such as flattening of the cornea and crystalline. As to refractive density, there is probably an increase rather than a diminution of it, but this appears to be more than overbalanced by the diminution of curvature.

The situation of the retina too near the crystalline may be owing either to a preternatural shortening of the axis of the eyeball or a receding of the lens from the cornea.

In far-sightedness, the power of adjusting the eye to different distances is much weakened. In this respect far-sightedness differs from short-sightedness, in which the power of adjustment is still retained. In far-sightedness it may be said that the habitual adjustment of the eye is for distant objects, and that in trying to read, for example, the power of adjustment is exerted to the utmost, hence the fatigue and confusion of vision which soon ensue.

In many cases there is nothing peculiar to be observed in the eyes of far-sighted people; but frequently the eyes are sunk, the cornea flat, and of small diameter, and the pupil contracted.

Far-sighted people see small objects indistinctly at every distance, because when near, they are out of focus, and when removed from the eye somewhat, they are seen at a small visual angle and with little light. By increasing the light, they see better. Hence, they do not see so well by candle-light as before, and when attempting to read by candle-light, they place the candle perhaps between them and the book held at arm's length.

Large and distant objects they see very distinctly.

Far-sightedness seldom occurs except in persons who have passed middle age, and in them it is so common, that it is to be viewed as a natural change in the state of the eye. As it occurs in young persons, it will be spoken of under the head of *Asthenopy*.

Though instances have occurred of persons who have been long presbyopic, recovering their former vision, and thereby being enabled to lay aside the use of their spectacles, recovery from long-sightedness is not to be calculated on, but this is of comparatively small moment, as vision can be so perfectly assisted by means of spectacles.

Something, however, may be done in the way of preserving the sight by avoiding over-exertion of the eyes in reading and other minute work, especially by artificial light, at the time of life when far-sightedness, with diminution of adjusting power, usually comes on.

As soon as the eyes begin to feel hot and fatigued, we should take warning, and give them rest, by looking off the work before us. A person, when he does find himself to have become far-sighted, and compelled to use spectacles, should still refrain as much as possible from exertion of his vision by artificial light.

Convex glasses help the vision of far-sighted people for

near objects, by causing convergence of the rays of light before they enter the eye, so that they may be more speedily brought to foci than they would otherwise be, in consequence of the diminished refractive power of the eye; or, supposing the refractive power of the eye not diminished, but the distance of the retina behind the lens diminished, that they may be brought to foci at a less distance behind the lens, than they would otherwise be, in order to correspond with the diminished distance of the retina behind the lens.

Presbyopic persons, at the same time, that they have lost the power of adjustment for near objects, may be somewhat cataractous, or have their retina impaired in sensibility. In such cases, convex glasses, besides remedying the defective adjustment, are of use by concentrating the light.

Convex glasses are made of different degrees of convexity. The least convex being those adapted for the slighter degrees of far-sightedness, the more convex for the greater degrees.

To see distant objects, far-sighted persons do not in general require convex glasses. It is most commonly to enable them to read and do minute work that they use spectacles.

If it is only at a *very great* distance that a person can see distinctly, the focal length of the convex glass which he will require to enable him to read will be equal to the distance at which he wishes to see to read. [This paragraph will not apply to persons from 65 years and upwards.]

If he is not so very far-sighted, but can see small objects distinctly at twenty inches distance, for example, the focal length of the convex glasses, which he will require to enable him to read at twelve inches distance, is determined by multiplying the two distances together, and dividing

the product, 240, by the difference between them, viz., 8. The quotient 30, is the focal length in inches of the glasses required.

But when a person finds it necessary to have recourse to glasses for far-sightedness, he should go to an optician, and select two or three pairs which appear to assist his vision best, or send for two or three of about the focal length, which, according to the above calculation, he thinks will suit him, and try them leisurely at home for a day or two, before fixing his choice on one particular pair.

The following are the circumstances which should guide him in his choice:—The glasses should be of the lowest power which will enable him to see objects distinctly at the distance he wishes, and at the same time comfortably. Glasses which make the objects appear larger than natural, and strain and fatigue the eyes and cause headache, are not adapted to his case,—they are too convex. It is usually found that glasses the next degree more convex than those which suit by daylight, are required for work by artificial light.

The alteration in the eye on which the far-sightedness depends, generally goes on to increase with age, hence, it is necessary, after a time,—a few years,—to change the glasses first chosen for others more convex. In regard to this exchange it is to be observed, that it ought not to be too hastily had recourse to, nor, on the other hand, too long delayed. The same feeling of necessity which first prompted to the use of glasses, will indicate the necessity of change.

It is a not uncommon notion that glasses of certain focal lengths are adapted to certain ages, but this is erroneous. Still, though the choice of glasses cannot be determined by

the mere age of the person, there is a certain average relation between the age and the focal length of the convex glass required, which may be expressed as follows:

Age in years . .	40,	45,	50,	55,	60,	65,	70,	75,	80,	85,	90, 100
Focal length in inches	36,	30,	24,	20,	16,	14,	12,	10,	9,	8,	7.

[We more commonly commence with glasses of forty-eight inches focal distance at the age of 40 to 45, and progress in the same ratio.]

Glasses of a low power are popularly called *preservers*, and are sometimes had recourse to without any necessity, as if they possessed some specific quality preservative of the sight. The truth is, to good eyes they will prove not *preservers* but *depravers*.

Reading glass.—This is a double convex lens, broad enough to permit both eyes to see through it. It is used for the purpose of magnifying the object,—the names on maps, or the like,—whereas, convex spectacles are used merely to render objects distinct at a given distance, without magnifying them as above mentioned.

Cataract Glasses.

The difference in refractive power between the air and the cornea, being much greater than between the aqueous humor and crystalline body, the greatest amount of refraction which the rays of light undergo in the eye, in order that they may converge to foci on the retina, is that effected by the cornea on their first entrance. The crystalline body contributes comparatively little to the convergency. Hence, vision after a successful operation for cataract, may be *tolerably distinct* for objects at a certain distance. Still, in order, that it may be *perfectly distinct*, the use of convex glasses is required.

But as with the loss of the crystalline body, there is loss of the faculty of the eye to adjust itself for different distances, except so far as variations in the size of the pupil contribute to this effect, glasses of different degrees of convexity are required according as the patient wishes to view near or distant objects. Thus, convex lenses of two and a half inches focus are generally required for reading, and lenses of four and a half inches focus for viewing objects around him. [Lenses of three to three and a half inches focus for viewing objects near him, and for distant objects four to four and a half inches.]

Of course before fixing on any particular powers, the patient will try which suit him best, and the test which should guide him in his choice is, that when the spectacles are put on, or, if hand-glasses, when they are held immediately before the eyes, he sees objects distinctly at the same distance as he saw them before he became blind. [Hand glasses as a general rule are objectionable, particularly for cataract cases such glasses should always be placed before the eyes in spectacle frames.]

Recourse is not to be had to the use of cataract glasses until the eyes have perfectly recovered from the operation, and have been so for some time,—say six months.

Cylindrical Eye.

Cases are met with in which the rays of light in entering the eye are refracted to a nearer focus in a vertical than in a horizontal plane. This would take place, if the cornea, instead of being a surface of revolution, in which the curvature of all its sections through the axis must be equal, were of some other form, in which the curvature in a vertical plane is greater than in a horizontal. This is,

in fact, the natural form of the cornea, but in the instances referred to, existing, perhaps, in an exaggerated degree so as to disturb vision.

With such unnatural conformation of the eye, a point appears a line of a certain length; a circle an oval; every thing being seen elongated in one direction. The cylindrical deformation has been met with oblique, so that a square appeared a parallelogram.

The defect is remedied by glasses which, to the healthy eye, would make a line of the same length appear a point, —which would, in fact, shorten all objects in the same degree and in the same direction, as they are lengthened by the defective eye.* [Several cases of cylindricity have been known to opticians in this country, and have been satisfactorily relieved by glasses of the above kind.]

Each case of cylindrical eye being thus more or less peculiar, lenses must be specially prepared for it; and it is evident that this demands both skill and intelligence on the part of the optician. The general principle on which the glass is shaped, Mr. Ross informs me, is this: one side of the lens is made a portion of a cylinder, of the same diameter as the cylinder cornea, having its axis, however, placed at right angles to that of the latter. The other side of the lens is made plane, convex, or concave, to suit the condition of the eye irrespective of its cylindricity.

Conical Cornea.

Defective sight sometimes occurs, in consequence of the cornea gradually becoming so prominent in the middle, as to be of a conical shape. Short-sightedness first attracts

* "On the Use and Abuse of Spectacles," by Andrew Ross, optician, London.

attention, and by and by vision becomes very indistinct at any distance. This is owing to the irregular refraction of the light. Deep concave glasses afford some assistance to vision; but only in the slighter degrees of the complaint.

Loss of power of adjustment.

The eye may fall into a state in which the vision is neither myopic nor presbyopic, and in which the power of accommodation being lost, convex glasses are required to see near objects, and concave glasses to see distant objects.

Chromatic or colored Vision.

The colored vision to be noticed here must be distinguished from that dependent on subjective excitement of the retina to be considered below.

Although the eye, strictly speaking, may not be perfectly achromatic, it is so in the healthy state to all intents and purposes; but in certain morbid states, its optical parts may become so suffused and deranged as to decompose the light, and make objects appear as if surrounded by the colors of the rainbow, thus:

1st. In catarrhal inflammation of the eye, films of mucus suffusing the cornea give rise to the appearance of iridescence around objects.

2d. When there is defective adjustment of the eye, and when, consequently, the rays of light do not fall in foci on the retina, vision, at the same time that it is thus rendered indistinct, and even multiplied, may appear slightly iridescent. Hence irideseence around objects is seen when the adjusting power of the eye is disturbed by passion, mental abstraction, sleepiness, the action of belladonna, mydriasis.

Hence also, persons who have one eye myopic and the other presbyopic, often see colors when they look at very near or very distant objects with both eyes, because one eye only is adjusted to the distance of the object.

Diplopy or double vision, and Polyopy or manifold vision with one eye.

In consequence, probably, of the refractive media of the eye not having perfectly regular curves, double vision and manifold vision with one eye occur, as just mentioned, when the eye is not adjusted to the distance of the object looked at; hence short-sighted people see distant objects, and far-sighted people near objects, double or multiplied with one eye as well as iridescent.

But vision of one eye may be double or multiplied independently of defective power of adjustment to distance, in consequence of partial opacity of the cornea, or, more generally, partial opacity of the lens or its capsule. The action of these morbid states is well illustrated by Scheiner's experiment, which consists in looking at a pin, for example, through two pinholes in a card, placed so close to each other as to be included within a circle not exceeding the pupil in diameter. The pin appears double, except when held at a certain distance—that of perfect vision with the naked eye.

Asthenopy, or incapacity to keep the eyes fixed on near objects.

An incapacity to exercise vision on near objects, as in reading, sewing, and the like, for any length of time. The patient is able at first to see to read quite distinctly, but

the vision soon grows confused. The words appearing as if mixed together. The eyes, at the same time, become tired and painful—the pain extending to the head.

If the eyes are closed, and rest given to them for a few minutes, vision may be again exercised, but in a short time the eyes will become fatigued and the vision confused as before.

Vision for distant objects is not disturbed, and by the use of convex glasses the exercise of sight on near objects may be much assisted.

Asthenopy commences in childhood or youth, and may continue throughout life; but it is seldom met with originating in middle age.

The subjects of the affection often, but by no means always, labor under general nervous debility—the result sometimes of general disease.

There is often no evident cause. A very frequent cause is pure over-exertion of the eyes, as in students, artists, clerks, engravers, watchmakers, tailors, sempstresses, &c., especially by artificial light, together with want of sleep, want of exercise in the open air, and too early use of the eyes during convalescence after any severe illness. The complaint sometimes occurs as a consequence of inflammation of the eye, especially scrofulous, external and internal. Losses of blood, prolonged suckling, venereal indulgences, and the like, excite the affection, apparently by occasioning general nervous debility.

Asthenopy appears to consist in weakness of the apparatus by which the eye is adjusted for the vision of near objects. It is as if one were to hold a book too near. Though he might be able, by an effort, to adjust his eyes

so as to see to read for a minute or two, the sight would then become confused and the eyes tired. The use of convex glasses would, however, prevent this. Along with the defective power of adjustment there is an irritable state of the retina, connected in some manner with tendency to internal congestion of the eyes.

Asthenopy is principally to be distinguished from presbyopy, night-blindness, and amblyopy, or incomplete amaurosis.

The prospect of complete cure is, on the whole, unfavorable, especially if the complaint is of long standing; less unfavorable, provided what appears to be the exciting cause admits of removal. Asthenopy, though it has become confirmed, is not likely to end in blindness.

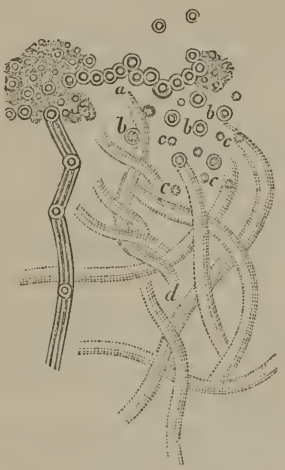
The first thing in the way of prevention and treatment is the avoidance, or removal by appropriate means, of any cause which may appear to be in operation, such as overuse of the eyes, and other causes above enumerated.

Rest to the eyes, the occasional application to them of cold water, good diet, exercise, country air, sea-bathing, and the like, must in general constitute a leading part of the treatment of asthenopy.

When the patient requires to employ his eyes on near objects, he has no other resource than to use convex glasses, which, in some cases, must be of the very lowest power only; but it would be advisable for the patient, if his occupation requires much use of the eyes, to change it if possible for one of an opposite kind.

Muscæ volitantes, or appearances like flies floating before the sight.

Muscæ volitantes are described by the patient who has made no particular examination of the appearance, as blackish motes, or a thin gray film, like the wing of a fly, or semi-transparent gray threads, like spiders' web; but if viewed attentively against the clear sky, a white wall, or the like, they are recognized to be made up of some such appearances as are represented in the annexed figure.



According as the distance of the field against which the appearances are viewed is greater or less, they are seen larger and fainter, or smaller and more distinct.

Vision is not affected by floating muscæ. Between the several portions of the muscæ and by the side of them, the eye still sees with perfect distinctness. And after the

muscæ have ascended out of the field of view everything is clear.

Floating muscæ are often detected suddenly, and thus are supposed to have just occurred. They are most observed when the patient looks at the clear sky, a thin cloud, snow on the ground, a white wall, or the like. They are indistinctly, if at all, noticed under the opposite circumstances of a dull light and looking at a dark object. They are not much seen when near objects are looked at.

They are generally observed to one or other side or above or below. The patient thus seeing them only by a side glance, finds it difficult to fix them in order to study their appearance. They move as the eye moves upwards and downwards, or from side to side; but besides this motion, which, as dependent on that of the eye, is merely apparent, the muscæ have a real motion of their own, and still more extensive than their apparent motion. Thus, if, from looking before him in a horizontal direction, the patient suddenly raises his eyes and fixes them on some object above the horizon, he observes that the muscæ fly upwards considerably beyond that degree of elevation, and even beyond the field of view, and then come sailing down before him till they disappear below.

Besides the motions of ascent and descent, the muscæ volitantes under consideration present lateral movements, although less marked, as well as changes in the relative position of their several parts.

Floating muscæ are to be distinguished from *fixed muscæ*, appearances which have no real motion, but apparent motion only depending on that of the eyeball. Fixed muscæ are owing to insensible spots of the retina.

Hitherto a very common opinion as to the nature of floating muscæ has been, that they are sensations, depending on some intrinsic change of state of the optic nervous apparatus, thus confounding them with fixed muscæ; but that they are truly sensations, occasioned by the presence of particles in the interior of the eye, and close in front of the retina, throwing their diffracted shadows on that nervous expansion, admits of demonstration.

But without entering minutely into the matter, the proposition may be easily illustrated thus: hold between a convex lens and the white surface on which the image of the light falls, some small object, as a pin. When this is near the lens, its shadow is not seen on the white ground, but when it is brought nearer and nearer the white surface, its shadow appears more and more distinctly.

The particles, moreover, appear to be of natural occurrence in the eye, for the appearance of floating muscæ may in general be seen by any person on simply looking through a small aperture in a card at the clear sky, or through the eyeglass of a compound microscope at the flame of a candle two or three feet distant, or simply by nearly closing the eyelids, and looking at a lighted candle.

Muscæ volitantes are often seen by persons without any particular notice of them being taken, as they are indistinct, present themselves occasionally only, and are therefore not troublesome. They are seen most distinctly, and are therefore most troublesome, when there exists an irritable state of the retina. Such a state of the retina may therefore be viewed as the general condition on which floating muscæ, considered as a disease, depend.

Dilution of the images of external objects favors—dis-

tinctness, on the contrary, prevents—the perception of muscæ. Hence, when the person is short or far-sighted, they appear less evident to him when he uses the glasses fitted to render his vision distinct.

As exciting causes of the complaint, may be mentioned —over-use of the eyes on minute objects; inflammatory diseases of the eyes, external as well as internal; the seeking for them in experiments; intemperance; febrile diseases; influenza; disease of the heart; want of sleep; dyspepsia; abdominal congestion; hysteria; hypochondriasis; morbid sensibility of the system generally, arising from pressure of business, anxiety, and distress of mind. All these causes appear to operate in the same manner, occasioning a congested state of the eyes.

When a hypochondriacal person once detects muscæ volitantes, he takes such frequent notice of them, that they become to him more and more troublesome.

From what has been said, it will be seen that the occurrence of floating muscæ is of itself no indication that either cataract or amaurosis is taking place. If, however, there be along with the appearance of muscæ a failure of vision, and if that failure be not attributable to myopy or presbyopy, which may be ascertained by a concave or a convex glass not improving vision, then cataract or impaired sensibility of the retina may possibly exist.

In uncomplicated cases, the muscæ may indeed increase in numbers, but very slowly, and never to such an extent as to interfere with the distinctness of vision in any very serious degree. But very often the muscæ remain stationary, or even become less.

As they depend on the vision of objects naturally exist-

ing in the eye, and are distinctly observed only in consequence of a morbid sensibility of the retina, whatever tends to promote or relieve this will have the effect of promoting or relieving the muscæ.

The removal or abatement of the exciting cause, if it can be detected, is the first thing to be looked to in the treatment. Rest to the eyes, if they have been overstrained, relaxation from business, quiet to the mind, regulated diet and exercise, with change of air, are to be recommended. Bathing of the eyes with cold water two or three times daily, for five or ten minutes, is the most important local application.

ON THE USE OF SPECTACLES.

BY JAMES W. QUEEN, OPTICIAN.

There is a prevalent idea that spectacles or spectacle glasses should magnify to the wearer's eyes; a moment's reflection by those understanding the nature of vision or the first principles of the science of optics, will convince them that such an opinion is erroneous, and, if carried practically into effect, the result would be a permanent injury to that most delicate organ—the eye. Spectacle glasses undoubtedly must increase, or on the contrary, diminish the apparent size of objects, otherwise they

would be useless to those having impaired vision; that increasing or diminishing power, however, must be to the extent actually necessary to restore as it were the imperfection of the vision of the wearer and no more. "I wish a pair of spectacles to magnify, yes, to magnify very much," is a common call made at the optician's; what is the result if the applicant is furnished with such as are demanded?

First.—To see common objects, as reading, writing, or sewing, distinctly, a pair of magnifying spectacles, will oblige the wearer to hold such objects much nearer the face than the ordinary or natural distance of twelve or fourteen inches, thus making it very inconvenient, and certainly not improving the grace of position.

Second.—Magnifying spectacles present objects of an unnatural size, fine fabrics appear coarse and heavy fabrics still coarser. A person wearing such glasses when shopping, should have an attendant with young or natural eyes, to judge truly of the quality of the goods, for the wearer of the magnifying glasses is not capable of judging with accuracy.

Third.—A permanent injury to the eye is the sure reward for the indiscretion of wearing magnifying glasses; the eyes very soon become accustomed to the strong power and recession is impossible, a steady advance must be made in the power from time to time, and thus the wearer becomes a slave to spectacles by the indiscretion of having used magnifying glasses.

The true and legitimate use of spectacles, it will be seen by the foregoing remarks, is to render objects clear, distinct, and of the natural size, they should be selected to produce such an effect and nothing more.

The Quality of Spectacles.—Too much care cannot be exercised in obtaining glasses, or lenses, of such a quality as to give the necessary assistance to vision, without any risk of injury to the eye; the highest charges made by respectable opticians for a pair of spectacles, with correctly made and adjusted lenses, is so small that the most parsimonious should blush when attempting to cheapen so serviceable an article. A proper vigilance should be exercised with reference to the empiries who annually visit the various watering places with a newly discovered, patent Brazilian crystal, periscopic lens, or some other long and high sounding name to deceive the unwary; these summer resorts are the fountains where the traveling optician derives from the credulous, an abundance to enable him to live a life of ease for the remainder of the year; in a majority of instances, spectacles sold by these travelers have the very cheapest and lowest quality of lenses in them, and are well calculated to do a permanent injury to the eye. A prudent person on finding his vision becoming impaired, will resort to a dealer of some science and reputation, and with his advice, gained from experience, select such lenses as will relieve the sight and not add to the defect already existing.

Glasses having correctly ground and polished surfaces are the only kind that should ever be put before the eyes in spectacles, all others being bent or moulded to the form are positively injurious, and any lenses recommended as capable of permanently rejuvenizing the sight are deceptions and should be avoided.

Any vendor demanding an extravagant price for his lenses only, and claiming for them peculiar properties,

may be looked upon as attempting deception, for the very best glasses can be purchased for so small a sum, (less than half a dollar,) that there is no apology for claiming a high price.

When to commence the use of spectacles.—Spectacles should never be resorted to unless there is an evident necessity for their use; it is no unusual thing for persons to desire spectacles to preserve their sight, or in other words to get such as will prevent their sight from failing; there are also those who form the resolution never to wear spectacles; then there are those who desire the magnifying glasses when they commence.

It is necessary to resort to the use of spectacles when there is a disposition to put fine print or other small objects at an unnatural distance off to see distinctly, or when it is observed that the letters in a book seem to run together or become blurred, or when it is found necessary to put the book behind the lamp or candle to be able to read easily, such symptoms are the true admonitions of advancing years, failure of sight, and need of spectacles.

There are no glasses, no matter how costly, or by whom recommended, or by whatever new name they may be called, that will prevent the sight from failing as age advances.

It is folly to form the resolution never to wear spectacles. The writer has known persons to worry along for years, not able to see any usual sized print distinctly, and finally be compelled to resort to glasses, and be obliged to use so strong a power, that for a considerable time the spectacles were an annoyance, whereas, if spectacles had been resorted to when the symptoms of a failure of sight were confirmed, they could have been used with a pleasurable

relief. It is also great folly to use glasses of too strong a magnifying power, for the reasons already stated in the note on the use of spectacles.

Finally, refrain from the use of spectacles until there is a certainty that the sight has commenced failing, then select them of such a power, as may be found sufficient to make up the deficiency and nothing more; eschew all resolutions not to appear old, admit the necessity of and use spectacles, when nature admonishes you of a failure of sight. Never habitually use glasses to magnify, they will cause future trouble.

There is no certain age or time of life to commence the use of spectacles, other than the certainty of the sight having failed. Many do not require their assistance until fifty years of age, while the majority find it necessary to begin at forty or forty-five years. A long continued, close application to dark sewing or fine reading by an imperfect light, will generally cause an early failure of the sight, debility from attack of fever will often cause a failure or the necessity of stronger glasses by those already using spectacles.

Colored glasses are serviceable to protect the eyes from bright or intense light, it is very seldom that they can be judiciously used for reading or viewing near objects.

The London Smoke or neutral tint glasses lately introduced, have been found much more grateful to the eyes, and quite as effectual in protecting them from excessive light as either the green or blue glasses.

CHAPTER II.

AMAUROTIC AFFECTIONS, OR DEFECTS OF SIGHT DEPENDING ON PERVERTED, IMPAIRED, OR LOST SENSIBILITY OF THE OPTIC NERVOUS APPARATUS.

Abnormal excitement of Visual Sensations.

In amaurotic affections, various visual sensations though not in themselves unnatural, are apt to be excited unnaturally. Such sensations being important as symptoms, it is necessary to study them; but, previously to doing so, the circumstances attending their natural occurrence must in each case be taken into consideration.

Photopsy and Chroopsy, or sensations of light and color, independent of external light, excited by internal influences operating on the optic nervous apparatus.

In the unexcited condition of the optic nervous apparatus, there is darkness before the eyes, but in the excited condition, light and color are seen.

The agent by which the optic nervous apparatus is usually excited is the principle of light; but an excited condition, and consequently the sensations of light and color, may be called forth by other influences, such, for example, as pressure. And it is to be observed, that whatever may be the stimulus which excites the optic nervous

apparatus, no other sensations but light and color can be called forth in it.

It is indifferent what part of the optic nervous apparatus be excited in order that luminous sensations may be perceived—whether the retina itself be irritated, the fibres of the optic nerve in the orbit irritated or cut, or whether the cerebral part of the optic nervous apparatus be pressed on by congestion or tumor. Moreover, in whatever part the optic nervous apparatus be excited, the luminous sensation which results is always referred by the sensorium to the surface; not only to the surface, however, but as in natural vision, to without the body—(*projection outwards.*) See pp. 22 and 23.

A familiar example of a luminous spectrum of the kind under consideration is that which, on pressing the eyeball, is seen projected outwards, and on the side opposite to that where the pressure is applied.

Other examples are—a spectrum of the vessels of the retina, *light on a dark ground*, which, in certain states of the eye, is seen, and which is owing to pressure on the retina by its vessels in a state of congestion; the appearance of a shower of lucid globules before the eyes on suddenly rising from a stooping posture, from the disturbance in the circulation in the optic nervous apparatus thereby occasioned.

Analogous appearances of fiery sparks, flashes of light, and colored corruscations, occurring spontaneously, are symptoms of irritation or excitement of some part of the optic nervous apparatus, cerebral or ocular, from inflammatory congestion. As such inflammatory congestion may end in amaurosis, so the luminous and colored spectra are

symptoms of incipient amaurosis. They may continue to appear, however, after all visual sensibility is lost.

Sensations of color of the kind just considered are to be distinguished, on the one hand, from those which depend on an optical derangement in the eye itself, whereby its achromatism is destroyed, and on the other, from accidental or complementary colors, to be considered below.

Spectra consequent to impressions on the Retina and complementary colors.

In the natural state, the sensations of the retina remain a short space of time after the impression which occasioned them has ceased to act. Hence, an image of an object may continue to be seen for some seconds after the eyes have been turned away from looking at it. This phenomenon is, in general, most readily observed in twilight; in daylight, the impression of the object on the retina requires to have acted more intensely and a longer time to produce the effect.

The spectrum appears when the eyes are directed to the sky, projected in the distance and of gigantic size.

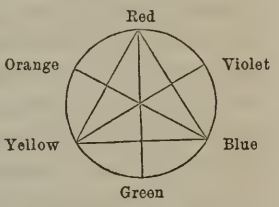
The spectrum is seen differently, according as the eyes, when turned away from the object, are darkened or directed to an illuminated surface. In the former case, the lights and shadows are the same as appeared at the time of regarding the object; in the latter, they are the reverse.

If the object from which the impression has been derived is colored, the spectrum is colored also, but differently, thus:—If the eye be fixed on a red-colored object for some time, and then turned away from it, a spectrum of the ob-

ject will continue to be seen, but instead of a red, of a green color. If, on the contrary, the object looked at be green, the spectrum will be red; again, if blue, the spectrum will be orange; if orange, the spectrum will be blue; if yellow, the spectrum will be violet; if violet, the spectrum will be yellow.

From this it is seen that the color of the spectrum is always that which, being added to the color of the object looked at, makes up the sum of the three prismatic colors, yellow, red, and blue, which, by their combination, form white light; hence the name *complementary* which has been given to the color of the spectrum.

In the annexed figure the primitive colors, yellow, red, and blue, are placed at the angles of the triangle, the compound colors, orange, violet, and green, at the intermediate points. The primitive color and the compound one, which thus stand opposed, viz., yellow and violet, red and green, blue and orange, are complementary of each other.



A spectrum is very readily produced by looking at the setting sun. If on turning the eyes away they are darkened, the color of the spectrum is at first luminous white; it then changes to yellow, and from that runs through the different colors of orange, red, violet, blue to black, when the spectrum ceases. If, on the contrary, the eyes are directed to a white surface, the spectrum is at first black, then blue, which color is succeeded by violet, red, orange,

yellow, until the spectrum, becoming white, is no longer distinguished.

In certain morbid states of the retina, even although vision be much impaired, the sensation remains after the impression a much longer time than natural; hence arise illusions of vision from the spectrum and complementary colors. In such a case, for example, if the person, after his eye has rested on some small and near object, the tassel of a blind for example, should accidentally look towards the sky, he will see a magnified image of it; but not aware of the cause, he is astonished by what appears to him a gigantic human figure in the air.

In illustration of the excitement of the sensation of light by other agencies besides the agent properly called light, and how apt people are to mistake the former for the latter, the following case is adduced:

Some years ago in Germany, a clergyman was assaulted one dark night by two men, one of whom struck him on the right eye with a stone. By the light which streamed from his eye, in consequence of the blow, the clergyman averred that he was enabled to see and identify the man who committed the outrage.

The question whether this was possible was actually raised in the criminal investigation, and the official district physician was referred to for his opinion. This gentleman, without fully admitting the possibility of what the clergyman maintained, still thought that there was some probability in it.

Professor Müller, the distinguished physiologist of Berlin, who has well commented on this singular case, sarcastically but justly observes, that if the district physician had

pressed on his own eye in the dark, and tried to read by the light thereby emitted, he would probably have come to a more decided conclusion.

The alleged identification of a man in the dark by light struck from the eyes by a blow, is only paralleled by the celebrated exploit we read of in the adventures of the redoubtable Baron Munchausen. In an encounter with a wild beast, the German baron, to his dismay, found that the flint of his gun had dropped out. Fertile in expedient, however, our hero tells us, that he immediately gave his eye a blow, and thus struck fire from it sufficient to ignite the priming and discharge his gun, laying the animal dead at his feet!!!

Though the changes operating on the brain, whereby we are rendered conscious of sensations, are usually the result of the communication of impressions on the nerves of sense made by external agents, such changes in the state of the brain may be the result of the communication of changes in the state of the nerves of sense induced by impressions made by some agency operating within them, or they may be primarily induced by some cause directly operating within the brain itself, as appears to have occurred in the following case—

A women, deaf for some years, and troubled with noises in her head, became subject to photopsy also; and fell into the hallucination of supposing that people had everywhere conspired to annoy her, by throwing glares of light into her eyes. I found it impossible to convince her of the real nature of her complaint. Her intellect was evidently impaired, from the same disease of the brain to which the noises in the head and the photopsy were owing.

Phantasms.

Besides the subjective sensations now spoken of, and which are owing to the communication to the brain of a change of state of the nerves of the senses concerned, induced by a cause operating within them, there is another class of subjective sensations which have their origin in the reaction of the mind on the senses. To this class belong *phantasms.*

Phantasms of touch are exemplified in the pains of hypochondriacs. In regard to phantasms of hearing, people sometimes imagine that they hear not only sounds but spoken words. The phantasms of vision are those, however, which have attracted most interest. Appearances as if of various objects—landscapes and figures, for example—even walking figures—present themselves before the eyes. Nay, phantasms of both hearing and vision may occur together—the human figures seen, being, at the same time, heard talking. In the celebrated case of Nicolai, the Berlin bookseller, the phantasms were, at first, *seen only*, but after a time, they were *heard also.*

Phantasms are of most common occurrence in disease, under the influence of opium and other narcotics, in drunkard's delirium, and in insanity; but they may appear to persons otherwise healthy, though in an excited state either from original temperament, or in consequence of being placed in exciting circumstances. And of course, exciting circumstances will operate more strongly on a person already excitable from original temperament.

The mental state excited by some strong impression, or by long brooding on a cherished scheme, may, by its re-

action on the senses, give rise to a vivid production of phantasms relating to the predominating idea.

This is exemplified by Shakespeare, when he makes Macbeth exclaim:

> "Is this a dagger which I see before me
> The handle toward my hand? Come, let me clutch thee:
> I have thee not, and yet I see thee still."

We have a similar example in Brutus—"midst his slumbering host, startled by Cæsar's stalwart ghost."

Phantasms occurring in persons of strong mind and cultivated intellect are recognized as such. This was the case with Nicolai, already referred to. The arguments used by the epicurean Crassus, to tranquillize the mind of his friend Brutus, after being startled by the apparition of Cæsar, showed that he took a correct view of the matter, attributing the phenomenon solely to the imagination; and Shakespeare makes Macbeth raise the question, when he adds to his first exclamation:

> "Art thou not, fatal vision, sensible
> To feeling, as to sight? Or, art thou but
> A dagger of the mind; a false creation,
> Proceeding from the heat-oppressed brain?"

In the case of persons of uncultivated intellect, phantasms have, no doubt, been the origin of many ghost stories. Whilst in persons of weak intellect, not otherwise actually insane, they may lead to hallucinations prompting to insane actions.

Every one has heard of the phantasms excited by the use of opium, and the still more remarkable ones excited by Hashish, or Indian hemp—the drug said to have been used by the sect of Assassins, under the blow of one of

whom, Conrad, Marquis of Montferrat, one of the leaders of the Crusaders, fell, to raise phantasms, and thereby excite themselves to their violent deeds—hence the name Assassin.

The occurrence of phantasms in insanity has been mentioned, but it would be out of place here further to refer to them.

I come, in the last place, to notice the phantasms on which has been founded a belief in "second sight."

That kind of second sight referred to by Campbell, in the following lines:

> "'Tis the sunset of life gives me mystical lore,
> When coming events cast their shadow before."

is, after all, a natural enough kind of second sight, and one which we all acquire more or less by the experience of life.

Persons said to have been endowed with "second sight" among the Scotch Highlanders, appear to have been of excitable temperament and deeply contemplative character. Alan Macaulay, in Sir W. Scott's "Legend of Montrose," is a good example. Such a person, having his mind intently and anxiously fixed on some stirring enterprise, may readily be supposed, when wrought up to a paroxysm of excitement, to have had presented to his mind's eye, and with all the distinctness of reality, a possible combination of events. In any case, when the events turned out in the combination predicted by the seer, the vision was received as supernatural, and the case was treasured up in the memory of those concerned. But when the events did not correspond to the prediction, the failure, as generally happens in unsuccessful cases, was unnoticed and forgotten.

Impairment and loss of sensibility of the Optic Nervous Apparatus, or Amaurosis in its various degrees.

The sensibility of the retina is greatest in the middle; from thence it diminishes towards the circumference.

In consequence of this, we see only that part of an object very distinctly to which the axes of the eyes are at the moment directed. In examining an object, therefore, the axes of the eyes are so moved, that the central region of the retina may be successively impressed by the image of its different parts.

The difference in the degree of sensibility of the middle and circumferential parts of the retina may be illustrated by a reference to the difference in the degree of sensibility of the skin of the lips for example, and the skin of the cheeks. Whilst the points of the two legs of a pair of compasses, when separated a very short distance from each other, are applied to the skin of the lips, the mind distinguishes the two impressions; but when applied to the skin of the cheek, there is no distinct perception of two points, but a sensation as if one impression only were made.

As impressions on the less sensitive skin of the cheek are perceived, as if smaller than impressions on the more sensitive skin of the lips; so objects seen by the less sensitive circumferential part of the retina appear smaller than when seen by the more sensitive middle part; or, *ceteris paribus*, an imperfectly illuminated object appears smaller than one brightly illuminated. In like manner, when the sensibility of the retina is impaired, objects appear smaller than natural.

Daltonism, or defective perception of Color.

Numerous cases are recorded, in which persons were unable, in different degrees, to distinguish certain colors, their sight in other respects being unimpaired. Mr. Dalton, the late celebrated chemical philosopher, who was so affected, wrote on the subject; hence the name, *Daltonism*.

["Since the publication in 1794, by Dalton, of his own case, the occasional occurrence of the peculiarity of vision called "color blindness," has been well known to the world.* But Dr. Wilson† has the merit of being the first to call attention to the fact, that in several of the lower walks of life, this bodily imperfection not only incapacitates the individual from following his calling with success, but sometimes may imperil the lives of others as well as his own. Not only does the weaver, the tailor, the gardener, thus affected, commit mistakes, ludicrous enough to the bystanders, yet likely to lead to the starvation of the poor man who by them loses his work; but the railway guard or pointsman, and the sailor, especially in steam service, may, by misunderstanding colored signals, cause the death of thousands. We think, therefore, much gratitude is due to the Professor of Technology for thus calling attention to the subject, and investigating it with the industry exhibited in the volume.

"Three forms, or rather degrees, of color-blindness are distinguished by the author.

* Before that essay, only occasional notices of the phenomenon had occurred. These are collected by Wartmann, a translation of whose paper may be found in Taylor's Scientific Memoirs for 1846, p. 162.

† Researches on Color-Blindness. By George Wilson, M. D., F. R. S. E., Regius Professor of Technology in the University of Edinburgh. Edinburgh, 1855. pp. 180.

"1. Inability to distinguish between the nicer shades of composite colors, such as browns, greys, and neutral tints.

"2. Inability to distinguish between the primary colors, red, blue, and yellow; or between these and the secondary and tertiary colors, such as green, purple, orange, and brown.

"3. Inability to discern any color, properly so-called, so that black and white (i. e., light and shade) are the only variations of tint perceived.

"The *first*,* or lowest, degree is *apparently* the rule rather than the exception among persons of the male sex, whose eye has been as little educated as is usual in our unæsthetic community. Dr. Wilson found that of sixty persons attending the Chemical Class of the Edinburgh Veterinary College, the great majority declined to give names to any colors but red, blue, yellow, green, and brown. Without care, one might easily be led into thinking colored-blindness to be much more common than it really is. But where the subject has so seldom entered the mind, and where the nomenclature consequently is so defective, it is better to dispense altogether with the *names* of colors in testing cases of this affection, and to set the task of arranging pieces of cloth or skeins of worsted in such a way that the same colors and shades should be classed together. When this is done, it will frequently be found that those who make no mistake in matching full tints of the primary and secondary colors, err in certain of the fainter shades of both, and in all the shades of some of the more mixed colors. Thus the difference between pink and pale

* British and Foreign Medico-Chirurgical Review. No. xxxv. July, 1855, p. 56.

blue is a puzzle to many who do not otherwise confound colors.

"'Mr. Crombie, dyer, Brown street, Edinburgh, informs me of three persons known to him, connected with dyeing, to whom the tints in question were a constant source of mistake. Messrs. Grieve, late of South Bridge, had in their employ a person who could match all colors but drabs. Professor S. is never certain, even by daylight, of the difference between blue and green; and many persons confound pink with pale yellow.'

"Where this slight degree of color-blindness is congenital, it is just as incurable as the more marked forms. But still it is practically convenient to separate it from them, because up to this point it may be simulated by a want of discrimination, which is simply the result of deficient education, and which, therefore, attention is quite capable of removing.

"The *second* form is that which Dr Wilson has most investigated, and has cited in detail a great number of marked cases. In it, red, blue, yellow, purple, orange, green, brown, &c., are respectively mistaken for one another, or confounded together. In less severe cases, the majority of colors are seen accurately, but two at least, (as red and green,) and generally four, (as red, green, olive, and brown,) are not distinguished from each other.

"There is a considerable difference between the colors as regards their liability to be mistaken for one another; and curiously enough, it is those which to ordinary eyes appear most violently contrasted, that are confused together, whilst tamer and less vivid tints are correctly

appreciated. Thus, while yellow is almost universally recognized, and rarely mistaken for its complementary purple, red, however glaring, is constantly confounded with green, very often with black, and for some appears to have absolutely no existence. Blue, when pure, is usually detected pretty readily, and also yellow, as above mentioned; yet their combination, green, is one of the greatest stumbling-blocks to the color-blind.

"The *third* variety, where all objects are to the eye mere light and shade, and where absolutely no difference between colors can be detected, is extremely rare, and no instance appears to have come under the observation of the author. One, however, which he describes, is a near approach, viz., of the physician (Case VIII.) who confounds *all* colors equally by daylight, though by gaslight and transmitted light he is able to sort them rightly.

"The disadvantages of this defect, even in its slightest degree, we hold to be something positive, and worthy of consideration. It is surely a misfortune to miss one of the purest and seldomest-abused pleasures which God has given us: but independently of that, it obviously renders a man less fit for a great number of positions in life to which inclination and circumstances might otherwise lead him. Mourning warehouses are, doubtless, a great resource for the unfortunate attendant, who matches red with black—but what is to happen to the house-painter accustomed to have his colors mixed by his wife, when he becomes a widower? We have ourselves interceded for a country carpenter who painted half a railing leaden-grey to match a green, and saved him from losing his job as well as his paint; and how a barrister would annihilate

the medical witness who could not distinguish an arsenical precipitate by its tint! Dr. Wilson's stories of the tailor who sewed a black coat with red thread—of the chemical lecturer who always had to ask, instead of telling, his pupils the colored reactions in his experiments—of the physician to whom *scarlet* fever had no existence—of the gentleman who condoled with a female friend dressed in vivid green, supposing her to be in mourning—of the Quaker who bought a bottle-green coat for himself and some scarlet merino for his wife—of the schoolgirl attempting to arrange the colors in her drawing by the taste, &c., &c., are striking and amusing instances of the difficulties consequent on this defect. One wonders how he managed to come across so many; but that is explained by his having advertised in the 'Athenæum' the fact of his being engaged in these researches, and obtaining in answer, the details of their cases from the sufferers themselves.

"But of more importance is the consideration that the use of color in railway and naval signals sometimes places the lives of hundreds on the chance of the interpreter having as full a conception of the chromatic tints, as the captain or the board of directors; and the first discovery of the defect may be at a grim inquest which it has given rise to.

"In the Admiralty notice respecting lights to be carried by sea-going vessels, to prevent collision, which is at present in force, the order is that all British steamers are to show, 'between sunset and sunrise, a *white* light at the foremast head, a *green* light on the starboard side, and a *red* light on the port side.' When, then, one vessel is

crossing another's bows, the foremast light goes for nothing, and the steersman of the latter is expected to know by the color which side of the crossing vessel is towards him, and consequently if it is going to his right or his left —and on a dark night has no other guide whether he should port or starbord his helm. A similar principle is applied, both by night and day, in railway signals.

"The number of the color-blind is larger than has been generally supposed. From a table exhibiting the results of the examination of 1154 persons of various classes, at Edinburgh, in 1852–53, it may be inferred that in the northern metropolis 5·6 per cent. (or more than 1 in 18) are thus defective. Of this 5·6 per cent., 1.8 per cent. (or 1 in 55) confound red with green; 1·6 per cent. (1 in 60) confound brown with green; 2·2 per cent. (or 1 in 46) confound blue with green. Dr. Wilson remarks, that the distribution of these numbers among different classes of the population is 'most capricious,' and makes no attempt to trace it as peculiar to any.

"As to the influence of sex, Dr. Wilson's researches, both the earlier series included in the body of the work, and latter contained in the appendix, show that color-blindness is much rarer among females than males. He does not, however, give numbers, but proposes the subject as one open to inquiry by teachers of schools, medical inspectors of factories, &c.

"The thirty-four pages devoted by the author to the discussion of the theories of this defect are inconclusive, and, from the very fact of their inconclusiveness, will not bear condensation. All that he deems himself entitled to affirm is, that in the color-blind 'the cerebro-retinal apparatus

of vision is unendowed with that sensitiveness to colorific impressions which it possesses in those whose vision is normal;' that is to say, that the cause lies between the humors of the eye-ball and the mind, excluding both the suggestion of Dalton, of its being due to the existence of an abnormal coloring in the lens or vitreous humor, and the idea which might not unnaturally occur to a metaphysical theorist, that the defect was not in the body at all, but in the mind. Dr. Wilson has spent several pages in overthrowing the first-mentioned explanations; and it may be observed, that his trouble is not without considerable practical importance, for an Italian oculist, Dr. Trinchinetti, has actually proposed the extraction of the lens as a cure. To stop him, if possible, from carrying his design into execution, a case is recorded of a gentleman who had both lenses removed for cataract, and experienced afterwards, on many occasions, temporary attacks of color-blindness, which before the operation never occurred.

"The great majority of cases of permanent color-blindness are congenital, and their cause is to be sought only in the theories above discussed; but instances of it are related by Mackenzie, White Cooper, and others, where it could be traced to 'congestion, hepatic derangement, and dyspepsia.'* The disorder is usually temporary under such circumstances, and disappears after the general treatment employed for the state of health. A curious example is, however, detailed among Dr. Wilson's cases, where it was caused by a severe accident, attended by concussion of the brain and long-continued cerebral excitement. Here the

* Article, Vision; Cyclopædia of Anatomy and Physiology.

color-blindness was permanent, and assumed all the intensity and usual symptoms of the congenital origin.

"The colors most generally confounded were, red and brown with green, and pink with blue. Yellow and blue were the colors most readily recognized.

"The affection appears to have been, in most cases, congenital, and incurable.

"The cure of color-blindness by any physical agents seems hopeless; and, according to Dr. Wilson's experience, education seems to do but very little towards removing the defect from the body or the mind, whichever it is situated in. No case is on record among the many highly educated persons who have thus suffered, of any body inventing a means of improving their power of chromatic diagnosis.

"There are, however, some methods of alleviating or correcting the false judgments which the imperfect sense is led into. One is the *comparison of doubtful with known colors*, by carrying about a chromatic scale, accurately tinted and named. This, however, is available only to a limited extent—that is, as far as the colors of the scale itself can be distinguished. Another is the *employment of touch*, to distinguish the alterations in texture made by different dye-stuffs. This may be of some use to clothiers, weavers, &c., who have a limited number of goods to arrange, but would not assist a customer in purchasing unknown articles. Perhaps to painters *the sense of smell*, higher educated than is usual, might be a help, and would not be open to the obvious objection lying against the employment of the taste.

"A more important suggestion, which we owe to Dr. Wil-

son, is the *substitution of artificial light for solar* in the examination of colors. It certainly is a strange thing that candlelight, which to the healthy eye causes a confusion of delicate tints, should render them more easily distinguishable by a morbid sense. Such, however, is the case, as several examples quoted by Dr. Wilson are sufficient to show. The most striking of these is that of a draper, who has long been in the habit of keeping a gaslight burning in a dark room, to enable him by day to distinguish scarlet from green, and crimson from blue. This is quite sufficient to induce every color-blind person at least to try the effect of artificial light in correcting his erring perceptions.

"From the observation, that it is the yellow color of ordinary artificial illumination which assists the color-blind—very white light, such as the lime-ball and electric charcoal light, being as useless as the solar rays—Dr. Wilson inferred that the *employment of yellow or orange transparent media* might be of advantage; and such has proved to be the case in several trials. It is, however, as might be expected, an inferior expedient to the direct use of yellow illumination; and the question of the best coloring substance, whether silver, uranium, iron, or organic matter, is still open to experiment in each individual case.

"The employments for which color-blindness most seriously disqualifies, are those of sailor and railway servant, who may daily peril human life on an indication which a colored flag or lamp is intended to give. For this evil there are two remedies. First, a careful examination of the parties employed, to test their capability of distinguishing rapidly the signals used; and, secondly, to make

the shape and movement of signals the chief index of their meaning, so as to dispense with color except as a subordinate aid to this."]

Transitory Hemiopy, or, Half-vision.

The following is an account of hemiopy, by Dr. Wollaston, as it occurred in his own person : "I suddenly found, after violent exercise, two or three hours before, that I could see but half the face of a man whom I met; and it was the same with respect to every object I looked at. In attempting to read the name JOHNSON over a door, I saw only SON; the commencement of the name being wholly obliterated to my view. The loss of sight was towards my left, and was the same, whether I looked with the right eye or the left. This blindness was not so complete as to amount to absolute darkness, but was a shaded darkness, without definite outline. The complaint was of short duration, and in about a quarter of an hour might be said to be wholly gone, having receded with a gradual motion from the centre of vision obliquely upwards towards the left."

More than twenty years subsequently, a similar attack occurred again, without Dr. Wollaston being able to assign any cause whatever, or to connect it with any previous or subsequent indisposition. "The blindness," says he, "was first observed, as before, on looking at the face of a person I met, whose *left* eye was to my sight obliterated. My blindness was in this instance the reverse of the former, being to *my right* (instead of the left) of the spot to which my eyes were directed; so that I have no reason to suppose it in any manner connected with the former affection.

. . . On this occasion the affection, after having lasted with little alteration for about twenty minutes, was removed suddenly and entirely by the excitement of agreeable news respecting the safe arrival of a friend from a very hazardous enterprise."

In some persons, the affection is of frequent occurrence, coming on along with indigestion, headache, and nausea, but going off in a few hours.

According as hemiopy depends simply on fatigue or gastric derangement, so must the treatment be regulated and the means adopted to prevent its recurrence.

Night Blindness.

Indistinct vision, recurring regularly at night, is sometimes met with as a congenital and habitual infirmity ; there are instances of its having prevailed as an epidemic. Most frequently it is met with as an occasional complaint, especially in warm countries and warm latitudes at sea.

In the beginning of the complaint the patient is still able to see objects a short time after sunset, and perhaps to see a little by clear moonlight, and he can see distinctly by bright candlelight. Vision, however, becomes more and more imperfect at night, so that, after a few days, the patient can no longer discriminate the largest objects after sunset or by moonlight, &c. ; and, after a longer lapse of time, he ceases to see any object distinctly by the brightest candlelight.

The principal causes of night-blindness appear to be fatigue and exposure to the strong light of the sun and gastric derangement ; lunar influence is also considered to

operate as a cause. I have met with two cases apparently arising from exposure of the eyes to naphtha vapor.

Congenital night-blindness sometimes affects more than one member of the same family. A most remarkable history of night-blindness, hereditary in one family for two centuries, has been recorded.

Under proper treatment, the prognosis, in cases of the occasional form of the complaint, may be always favorable. The duration of the disease is generally from two weeks to three or six months. If, however, it be neglected or mistreated, vision may become imperfect in the daytime as well as at night.

Europeans who have been once affected with night-blindness are particularly liable to a recurrence of the complaint as long as they remain in tropical climates.

Fixed Muscæ.

These appearances never change their position, either in regard to each other or to the optic axis.

Fixed muscæ vary in number, size, and form. At first semi-transparent, they afterwards become black, or at least dark. They appear in reading like blotches on the paper; but when the eyes are directed to a distant object, they appear so large that they cover it perhaps. Fixed muscæ are most distinct in the light; in darkness they are either not seen, or seen as luminous appearances. If confined to one eye, they are most distinct when the other eye is closed.

Fixed muscæ are owing to insensible spots of the retina. The centre of the retina is sometimes the part affected, and the appearance seen is that of a dark spot in the middle of

the field of vision. Thus the flame of a candle is, perhaps, invisible, whilst the light halo around is seen.

Muscæ may change in form, size, and darkness. And though any given musca may not alter its position, it may disappear, whilst others may present themselves in another part of the field.

The insensible spots of the retina on which the appearance of fixed muscæ depends, constitute partial amaurosis; this may pass into total amaurosis, the insensible spots gradually increasing in size until objects are no longer seen.

Fixed muscæ are often merely a symptom of evident posterior internal inflammation of the eye.

*Amaurosis.**

Amaurosis is impairment or loss of vision from disease of the retina, optic nerve, or part of the brain with which the optic nerve is connected.

Amaurosis is said to be *incomplete* or *complete*, according as the sensibility for visual impressions is impaired merely, or quite lost; and *partial* or *total* according as the defect of sight extends to a part only, or the whole field of view.

In incomplete amaurosis, the patient's field of vision is obscured as if a gauze or cloud were interposed between him and the objects looked at.

In partial amaurosis, the obscurity may involve the centre or the circumference of the field, or some one side only; or it may be limited to a mere spot, or to several

* Gutta serena of the Arabians, in contradistinction to *gutta opaca*, the name they gave to cataract.

spots dispersed throughout the field. Objects are thus seen or not, according to the part of the field of view in which they are situated; or if large enough to occupy the whole field, their circumferential or central part only is seen, or one half only, or a part here and there. When the insensibility is limited to a spot or spots merely, the appearance of fixed muscæ is occasioned.

Vision is often better one day, worse another; sometimes better in the morning, sometimes in the evening; sometimes better after meals, sometimes worse.

The amaurotic person generally sees an object indistinctly, until such time as he has steadily fixed his eyes on it. Sometimes, however, by moving the object before him, he sees it better than when at rest.

Objects sometimes appear smaller.

The patient usually sees better in strong light, but in some cases, better in dull light. Sometimes he is intolerant of light, even when the blindness is complete.

In some cases the patient sees distant objects better than near; in other cases again, near objects better than distant.

Photopsy, chroopsy, and the undue retention of impressions, giving rise to ocular spectra and complementary colors, are frequent attendants on amaurosis. The gauze or network seen in the light may still be visible in the dark; but instead of being gray or black, it is of a silvery or gold color.

The pupil is more or less dilated, and if not quite immovable, its movements are limited and slow. This, although one of the most characteristic appearances presented by the amaurotic eye, is not constant.

The invasion of the amaurosis may be sudden or gradual.

In the former case, vision may be at once wholly lost, or nearly so; in the latter case, it may be only after a time that the vision is seriously impaired. In some cases, the impairment of vision remains at a certain stage without advancing, in other cases it continues to increase, the obscurity thickening and spreading, until the whole field of vision is obliterated to the sense, the perception of light lost and the amaurosis complete. Sometimes amaurosis commences as night blindness.

Except when the case is of a purely local nature, both eyes generally become affected; one eye first, perhaps; and by-and-by the other. The blindness being complete and total in one eye some degree of sight may still be retained in the other.

The diseases the previous existence of which are often found to have some connection with the amaurosis, either as cause, or as depending themselves on the same cause, are, scrofula, syphilis, gout, rheumatism, indigestion, hypochondriasis, hysterics, apoplexy, epilepsy, paralysis, inflammation of the brain, typhus fever, lead poisoning, &c.

In some cases the disease is found to occur in connection with disturbed menstruation, hysterics, pregnancy, childbed, hemorrhoids, and again to disappear entirely, but to recur, and then perhaps to remain permanently.

The paralysis of the optic nervous apparatus, on which amaurosis depends, may be the result of morbid conditions of that apparatus, differing much in their nature :

They may be congestion or inflammation, and its consequences; nervous exhaustion ; super-excitation ; or pressure. And the retina, or the optic nerve, or the cerebral portion of the optic nervous apparatus, may be more particularly the part affected.

The causes to which congestive amaurosis is owing, are very various. Exposure of the eyes to strong heat and light, in those who work before large fires, &c. Over-exertion of the sight. Forced exertions of the body while stooping the head, especially in plethoric or drunken persons. Pregnancy. Sudden suppression of discharges—the menstrual, perspiratory, hemorrhoidal, purulent, &c. Irritation of the liver, stomach, and bowels, as in indigestion, costiveness, or worms. Passions of the mind. Fevers. Spirit-drinking. Excessive use of tobacco, &c.

Exhaustion of the optic nervous apparatus is often a mere accompaniment of general nervous exhaustion, arising from great loss of blood, or excessive discharge of secretions, as in protracted suckling, venereal excesses, or arising from grief and other depressing passions—from low nervous fevers, fright, &c.

The cases of amaurosis which arise from super-excitation occasioned by sudden strong impressions on the retina, such as an intense glare of light falling on the eye, concussion of the eyeball, or a stroke of lightning, and also those arising from overplying vision, appear to partake of the nature partly of nervous exhaustion, and partly of congestion. For example, the spot of the retina acted on by a sudden glare of light, or by smart concussion from a blow, is at once rendered insensible, and the result is a fixed musca, which may ultimately go away or remain; or the whole retina may become insensible, though this more generally takes place slowly, as a consequence of supervening congestion or inflammation.

Of the cases depending on pressure, the amaurosis is, in some, but a secondary consideration, more grave symptoms

of the organic disease being present; in other cases the amaurosis may be the only or principal appreciable symptom.

The prognosis in a decided case of amaurosis is most unfavorable. The disease, when it comes on suddenly, even when complete blindness is present, is not unfrequently relieved or cured, if it has not already existed long. The disease which has come on gradually, accompanied by pains in the head, is more hopeless in general, as in this case the cause most usually is material disorganization of some part of the optic nervous apparatus; whereas, sudden cases may be owing to some congestion, extravasation of blood, or the like, admitting of removal by timely treatment.

ON THE USE OF THE OPTHALMOSCOPE.

[Aid in the accurate diagnosis of certain diseases classed under the names of amaurosis, glaucoma, &c., can be obtained by the careful use of the Ophthalmoscope or Speculum Oculi.

"The chief value of which seems to consist in enabling the surgeon to set aside as positively hopeless, a large number of cases formerly termed amaurotic or nervous; which were assumed to be still curable, because their real nature could not be demonstrated. We now know that total disentegration of the vitrious body detachment of the retina from its connection with the choroid, and other

equally hopeless conditions of structure essential to vision may exist, without any alteration being produced in the outward appearance of the eye."*

The Ophthalmoscope I prefer and use, is the one usually attributed to *Anagnostakis*, a Greek physician, but which was introduced by the celebrated Graefe, of Berlin, who had shown it to his Greek friend when visiting that city. It is a single slightly concave mirror, with a hole drilled through its centre, and of about five inches circumference; it is fixed in a handle and is generally used with a small hand lens, interposed to act as a magnifier, unless the physician is *myopic*. To use it, the patient should be seated by a table in a dark room, with a lighted lamp or gas burner, stationed near his ear, and his eye dilated by belladonna or atropia. The observer must now seat himself before the patient, and so place the mirror that the light is thrown into the patient's eye, at the same time looking through the small central opening. As soon as the eye is illumed, which is known by a reddish color in the interior, the observer brings near to the patient's eye, a convex lens which converges the rays of light, that by the additional refraction they undergo, on entering the eye they quickly come to a focus, cross, and fall in a state of great dissipation on the retina, so that it is extensively illuminated. On withdrawing the lens gradually, the reflection grows smaller, until it becomes oblong and very brilliant. In this manner or modified, according to circumstances, any change in the transparent structure and retina are to be carefully noticed, and the true focus obtained, which no

* A Guide to Diseases of the Eye. By James Dixon: London, 1855. p. 7.

one can obtain unless he becomes familiar with the use of the instruments by frequent trials, and studies with care, the normal anatomy of the healthy eye and its retina.]

ARTIFICIAL EYES.

["The improvements which have of late been effected by the principal artists of London and of Paris, in the composition of, and method of coloring the enamels for artificial eyes, render the imitation so perfect that not only is the casual observer deceived, but even the professional man who is conversant with opthalmic practice may not detect the substitute.

"I find that patients always couple the idea of pain with the wearing of the artificial eye, and this arises from its supposed size, and the belief that the sensitiveness which belongs to the eye only in its integrity, is retained after its loss. With the destruction of the cornea the greater portion of the sensibility of the front of the globe is destroyed.

"An artificial eye, is but a very little light shell of enamel, made to represent the front of the living feature. The shape and size must vary to suit different cases, almost each requiring a different model, and this adaptation, and the correspondence in size with the other eye, demand much more nicety than is necessary to match the color.

"It is the duty of the surgeon to see that the entire surface, including the edges, is enameled, since it is a common practice for workmen, or rather agents for the sale of artificial eyes, who are not makers, to grind the shell to the required size without afterwards restoring the desired smoothness, for which the action of fire is required.

"When an eye is lost before the orbit has attained its destined growth, this cavity is never fully developed; and the earlier in life that the accident has occurred, the less will be its size, and the case will be proportionally less adapted for the assistance of art.

"Besides the removal of deformity, the presence of the false eye may be of essential service in keeping the lids in their natural position, and preventing the cilia from irritating the shrunken globe; in placing the puncta in a more natural position for conveying away the tears; in acting as a defence against intruding bodies, which are apt to be retained within the lids and to produce irritation; and as a means of keeping the cavity free from collections of lachrymal secretions.

"The lids may require some slight surgical operation, such as the removal of adhesions, or of thickened conjunctiva, or of ectropium.

"The eye is to be inserted in the following manner; it is to be wetted, and the broad or outer end first passed under the upper lid, slid as far as it will readily go, and kept there with the fore-finger of the one hand, while with that of the other, the under lid is drawn down till the lower part slips in. For removal, the lower lid must be depressed, and the finger-nail, the edge of a tooth-pick, the head of a pin, a little hook, or any small and blunt instru-

ment, passed under the edge and made to lift it forwards, when it will slip out; and care should be taken to receive it in the hand, or on a handkerchief, for a fall would be attended with fracture. A person soon learns to do this for himself. Occasionally it is necessary to accustom the lids to its presence by wearing it at first for a few hours only at a time, and it may even be requisite to begin with one of a smaller size than that to be eventually worn. All active disease should have passed away before one is used.

"An artificial eye requires great cleanliness in order to preserve it, and it should be removed every night. This cessation of use is farther necessary to prevent further ulceration of those parts on which its edges rest. If the globe be much reduced, the interior of the lids should be syringed with tepid water every morning. Should there be an habitual, unnatural conjunctival secretion, or should that be excited by the presence of the enamel, an astringent lotion used night and morning may remove or lessen it.

"Instances are met with in which the false eye causes too much uneasiness to be worn.

"After the gloss is lost, a new eye is needed; for if the damaged one be still used, irritation of the lids is set up. The average period of wear is about twelve months."*]

* A Treatise on Operative Ophthalmic Surgery, by H. Haynes Walton, edited by S. Littell, M. D. Philadelphia, Lindsay and Blakiston, 1853, p. 489.

CHAPTER III.

DEFECTS OF SIGHT DEPENDING ON LOSS OF CORRESPONDENCE OF THE SENSATIONS AND MOVEMENTS OF THE TWO EYES.

As an introduction to the present subject, the correspondence which naturally exists between the sensations and movements of the two eyes, requires to be taken into consideration.

Single Vision with two Eyes.

As the rays of light emanating or reflected from the different points of a visible object, proceed in all directions, and in straight lines, those from the same points must necessarily, some of them, enter the one eye, and some the other, and so impress both retinæ in the same manner, and at the same time. From this double impression, it is to be observed, we have not a double perception of the object, but only a single one, provided the eye be naturally directed, that is, provided their optic axes intersect at some point of the object, provided their centres of revolution coincide, and provided their horizontal and vertical diameters are respectively parallel.

When the two eyes are thus naturally directed, the parts of the two retinæ which receives similar and simultaneous impressions from the rays of light entering them from a given point of the object, are their vertices, and their vari-

ous parts equally situated in relation to them, on the half of one retina next the temple, and on the half of the other next the nose. These parts of the two retinæ, as similar and simultaneous impressions on them yield but a single visual perception, are called *corresponding or identical parts.*

If the two eyes are not directed in the manner above described, the rays of light from given points of the object will not then fall on corresponding parts of the two retinæ, and the consequence will be that the two impressions will be perceived by the mind separately, and the object will be seen double.

Amidst the various movements of the eyeballs, the correspondence in their direction necessary for single vision is maintained by the concurrent action of their muscles. (p. 24.)

Visual perception of the three dimensions of space, Length, Breadth, and Thickness.

By the combined action of the two eyes we are enabled to perceive at one glance the length, breadth, and thickness of objects. This is owing to the position of the two eyes in the head, by which each is fitted to receive on its retina a different perspective picture of the object in a manner analogous to that in which, with two fingers, we can receive impressions from two sides of a solid body, so that we recognize its thickness as well as its length and breadth, whilst the mind, in conformity with an original connate law of the economy, does not perceive two superposed dissimilar images, but only a single one, and that, unlike

either of the perspectives, in full relieve or intaglio, as the case may be.

The stereoscope shows this.

The stereoscope, it may here be observed, also shows how vain it is for a painter to attempt to represent objects in full relief or intaglio, as seen with the two eyes. All that can be really and naturally represented, by painting on a plain surface, is merely the *appearance* of relief or intaglio as seen when one eye only is used. This explains why it is that, in looking at pictures, we see them to greater advantage when one eye is closed; in fact, when we use both eyes, the appearance of relief, even as perceptible to one eye, is in a great measure destroyed.

The faculty of perceiving the three dimensions of spaces by the two eyes, implies the faculty of recognizing the distance and position of near objects by the same means.

Diplopy or double vision with two Eyes.

It is to be observed that double vision with two eyes is altogether different in its nature from the double or manifold vision with a single eye above considered, the latter being owing to irregular refraction. A case of double vision with two eyes is at once distinguished by closing one eye, when objects will be seen single.

Double vision with two eyes is the result of loss of the natural correspondence of the optic axes, the coincidence of the centres of revolution, and the parallelism of the vertical and horizontal diameters of the two eyes, the conditions on which, as above shown, single vision depends. The immediate cause of the derangement alluded to is, most frequently, paralysis of some one or more of the

muscles of the eyeball; but it may be some morbid production in the orbit, or the like, displacing the eyeball.

The relative position of the two images seen in double vision depends upon the direction and degree of the deviation of the eyes.

As sometimes the deviation of the axes or centres and diameters of the eyes exists only when the person looks in particular directions and at certain distances, so does the double vision in such cases take place only when the patient looks in those directions, and at those distances.

When double vision is owing to deviation of the optic axes, the misdirection of the two eyes may exist in various degrees, from an evident squint to a scarcely perceptible cast.

When, on the contrary, double vision is owing to deviation of the vertical and horizontal diameters of the two eyeballs from parallelism, in consequence of abnormal action of one of the oblique muscles, there is no deviation of the optic axes, and, consequently, no squint or cast.

The irregular or impeded action of the muscles of the eyeball, giving rise to diplopy, may be owing to an affection of the muscles themselves or of their nerves, or it may be owing to disease or injury of the brain, or to drunkenness, or fear, or to derangement of the stomach, &c.

Strabismus or squinting, and luscitas or immovable distortion of the Eyeballs.

Strabismus and luscitas are equally characterized by loss of the natural correspondence of the optic axes; but, in the former, this is owing to want of harmony in the movements of the eyes, not to loss of motive power, for the

squinting eye becomes straight and capable of being directed to any object when the other eye is closed; whilst, in the latter, it is owing to one eye being fixed more or less immovably in one direction, in consequence either of paralysis of the muscle moving the eyeball in the opposite direction, or of induration and shortening of the muscle, or the like, on the side to which the eyeball is turned.

The principal forms of strabismus or squint are the *convergent* or *inward*, and the *divergent* or *outward;* and of these the former is by far the most common.

The exciting causes to which strabismus is in different cases attributed, or attributable, are very various. They are such as the following:—Convulsions during infancy, difficult teething, hooping-cough, measles, smallpox, worms, injuries and diseases of the head, fright, anger, injuries, inflammation, and other diseases of the eyes, such as opacities of the cornea, imitation, and a habit of misdirecting the eyes.

Most commonly, squinting has its origin in early life; indeed, many of the diseases just enumerated as exciting causes of the affection are diseases of early life.

Frequently, no cause at all can be assigned.

In most cases the vision of the squinting eye is imperfect.

Whatever be the remote cause of strabismus, there can be no doubt that its proximate cause consists in some affection of the muscles of the eyeball. The question which this conclusion naturally suggests is, what is the nature of the affection of the muscles of the eyeball?

The various exciting causes of strabismus which have been remarked, such as imitation, affections of the mind—anger, fear, &c.,—disease of the brain, intestinal canal,

and other parts, together with the circumstance that it may occur occasionally only, and the phenomena of the distortion in general, all point to the muscular affection being owing to perverted nervous action.

When convergent squint is of recent origin, and if its exciting cause can be discovered, and is still in operation, the removal of it ought to be the first object of treatment.

It is scarcely necessary to say, that whatever prompts to a habit of misdirecting the eyes, whether imitation, trying to look at objects too near the eyes or otherwise disadvantageously placed, careless employment of the sight, and the like, must be carefully guarded against.

Exercise of the habitually misdirected eye during two or three hours daily, by covering the other eye, has often been found successful in curing squint. But it is apt to happen that, whilst the habitually misdirected eye becomes straight, the previously well-directed one turns in.

When convergent squint has become fully established it resists, as is well known, all treatment such as that above indicated, and no other help remains but the operation.

Operation.—This consists in division of the affected muscle, is very simple in the performance, and not accompanied by much pain.

Section of the internal straight muscle of the habitually misdirected eye alone may be sufficient, but section of the internal straight muscle of both eyes is generally necessary, as it is found that, if one eye only is operated on, it either still remains inverted, or, if it is rendered straight, the previously well-directed eye is apt to turn in.

The latter circumstance is analogous to that above pointed out, viz., that when the previously well-directed eye is

covered, and the habitually inverted one, by being thus called into exercise, becomes straight, the former turns in.

In general, little treatment is required after the operation.

It is, however, always advisable to keep the patient at rest for some days. The eye should be bathed with lukewarm water night and morning.

Should a return of the squint take place, the operation may be repeated. Sometimes success has been obtained only after a second or third repetition.

Paralysis of the muscles of the Eyeball and Eyelids.

It sometimes happens that a person is seized with inability to open one eye. When, in such a case, the upper eyelid is raised with the finger, it will perhaps be seen that the patient, though he can turn his eye towards the temple, cannot look inwards, upwards, nor downwards. If he attempts to look forward or to the unaffected side, the patient sees objects double, in consequence of the non-correspondence of the two eyes, and he is apt to become giddy if he tries to walk while he holds the eye open.

In addition to the defects in the moving power of the eyelids and eyeball just described, there may be persistent dilatation of the pupil, with impairment of sight, depending on that disturbance of the adjusting power of the eye.

Many such cases come on under the same circumstances as rheumatism, viz., exposure to cold and damp, and admit of being perfectly cured by active, general antiphlogistic and alterative treatment.

Sometimes the paralysis is of a more serious nature, being owing to some disease within the skull.

Cases of paralysis of the muscle which turns the eyeball outwards are of rarer occurrence than the preceding. There is no accompanying falling down of the upper eyelid ; hence the double vision, arising from the non-correspondence of the two eyes when the patient tries to look towards the side affected, is more felt.

This palsy is more tedious of cure than the preceding. .

Another form of paralysis is that in which the eyelids cannot be shut. In such cases, all the corresponding side of the face is usually more or less paralyzed.

These different classes of cases require early attention and careful treatment.

PART III.

CHAPTER I.

PREVENTION AND MANAGEMENT OF THE DISEASES OF THE EYES APT TO OCCUR AT THE DIFFERENT PERIODS OF LIFE.

Early Infancy, or period at and from Birth, up to Teething.

Ophthalmia of New-born Infants.—Within a few days after birth, though sometimes later, infants are liable to an inflammation of the eyes, attended by great redness and swelling of the eyelids, with discharge of yellow matter.

This disease, if taken in time, and properly treated, may be in general completely cured. Left to itself, or inefficiently treated, however, it will run on so as to cause material injury, too often total destruction of the eyes. This is the cause of blindness in a large proportion of the blind poor.

The manner in which this disease is neglected, among the poorer classes especially, is almost incredible, notwithstanding the needful advice and medicines may be had for the asking. It is usually only after the disease has been going on for two or three weeks, and when the eyes have already, perhaps, been irremediably injured, that the ocu-

list is applied to. In excuse for this neglect, we are often told, by the mother or nurse, that the complaint of the eyes was supposed to be *nothing more than a cold;* as if a cold in the eyes might not, and did not, in many cases, prove very destructive to vision. The truth is, that, in numerous instances, a cold has some share at least in the production of this ophthalmia of new-born infants.

Exposure of the infant's eyes, immediately after birth, to light, the heat of the fire, or draughts of air; careless bathing of the eyes, perhaps with a dirty sponge; the direct intrusion into the eyes of the soap used in washing the infant, or of the spirits sometimes rubbed over its head, appear to be common exciting causes of the disease. That the disease is also frequently occasioned by inoculation of the eyes with morbid matter during labor, there can be no doubt.

The circumstance that a number of cases often come under the notice of the practitioner at the same time, and that a considerable interval will elapse before any new cases present themselves, would appear to show that the occurrence of the disease, like that of epidemics, is in some manner influenced by the weather.

To guard against the disease as far as possible, the eyes of infants, immediately after birth, should be gently bathed with simple warm water, by means of a bit of soft linen rag, and afterwards carefully dried. The greatest attention should always be paid to protect the eyes from exposure to light, heat, and draughts of air. At the same time, it must be remembered that the air ought not to be confined around the infant's face. Of course, good ventilation of the apartment is essential.

In many cases of the disease, we find that the infant is not suckled, but is nourished with prepared food. Under such a mode of diet, we find the inflammation apt to run a more dangerous course; and there can be little doubt that the want of the natural nourishment often promotes the invasion of the disease. For this reason, as well as for many others, infants should always, if possible, be brought up on breast-milk alone.

That an infant is actually affected with the inflammation of the eyes under consideration, may be known by the eyelids being red and swollen at their edges, by their being gummed together after sleep, and by the discharge of yellow matter which takes place from between them when they are opened. As soon as these symptoms are discovered, medical assistance should be called in. Every hour's delay is fraught with the most imminent danger to the sight.

It is to be kept in mind by those engaged about the infant, that the disease is catching—that matter from the infant's eyes accidentally coming into contact with the eyes, even of a grown-up person, is apt to excite in them an equally dangerous and destructive ophthalmia. It is also to be kept in mind, that, in ill-ventilated apartments, infection may be propagated through the air, especially from one infant to another.

Even when the eyes are not materially injured, or totally destroyed by the ophthalmia of new-born infants, they are apt to be left in a much debilitated state and very susceptible of future disease.

Not unfrequently, when the eyes are sufficiently far recovered to admit of accurate examination, we discover central cataract.

Cataract in Infants.—Whether the central cataaract, which we sometimes discover after the subsidence of the ophthalmia of new-born infants, existed at birth, or came on during the inflammation, cannot always be with certainty determined, for want of previous accurate examination of the eyes at birth. There is, however, no doubt that the infant, at birth, is sometimes affected with cataract; and it is probable that in many of the cases of cataract first noticed in infancy and childhood, the opacity had already existed, though in a less degree, at birth.

Congenital cataract appears to be owing to an original imperfect formation of the crystalline lens; and, as in cases of congenital malformation of other parts of the eye and of other organs, several children of the same parents are sometimes found affected with it.

Though the occurrence of the disease in one child may make us dread lest the children of subsequent births be similarly afflicted, it is quite beyond our power to interpose any special means of prevention.

Of course, every attention should be paid to the mother's health during her pregnancy, and her mind should be, as much as possible, diverted from brooding over the idea that the infant she is carrying may be also born blind from cataract.

The only remedy for congenital cataract, as for the cataract which occurs at other periods of life, is an operation.

If the cataract be limited to a small dot of opacity in the middle of the pupil, no operation is immediately called for. When, however, the opacity involves the whole lens, and evidently interferes materially with the sight, it is proper to operate.

The period after birth when the operation for the cure of congenital cataract should be had recourse to is before teething commences; or, if that period has been allowed to pass, as soon after teething has been completed as possible.

The reason for the early performance of the operation is this:—As the infant cannot see, its eyes are not fixed on objects, but roll about in a heedless manner. This being allowed to go on, the infant loses command over the eyes, or rather does not acquire command over them; and even if sight be afterwards restored by an operation, the power of directing the eyes properly and steadily towards objects may never be fully gained.

It is also to be observed that good sight is more likely to be restored by an early operation. Moreover, the important opportunity of education of and by the sight is secured.

The operation for congenital cataract is division. Infants above two years old may be put under the influence of chloroform; but this is scarcely necessary in the case of younger infants.

They are sufficiently secured by wrapping them in a shawl, to confine their arms and hands, and laying them on their backs on a table.

The tender and delicate constitution of early infancy is no objection to the performance of the operation, because this is in itself extremely gentle. Not more than half a minute is taken up in its performance, and the pain is not greater than that of the prick of a needle. The infant will cry at the moment, but very soon after becomes pacified.

Usually no inflammation results, and in the course of some weeks the opaque lens is removed by absorption and sight proportionally restored.

Not unfrequently, however, some degree of opacity of the capsule supervenes, which may require a repetition of the operation for its removal from behind the pupil.

Congenital Imperfections of the Iris.—A congenital malformation of the eyes which sometimes occurs consists in an incomplete formation of the iris or its total absence.

The unfortunate subjects of this latter defect are painfully impressed by the too great influx of light into the eye, so that for relief they seek the dark, and keep their eyebrows depressed and their eyelids half closed. Their vision is also imperfect, partly from the dazzling which arises from the impression of too much light on the retina, and partly in consequence of such optical aberrations as it is the function of the iris with its pupil to correct. Comparatively small amelioration of the latter defect is derived from the use of an artificial iris, or dark plate with a small aperture in it, placed before the eye when the child is old enough to wear it.

In cases of congenital absence of the iris, if cataract does not already coexist, it is very likely to come on sooner or later.

Congenital Amaurosis.—It sometimes happens that an infant, though old enough to notice, does not follow a lighted candle or other bright object with its eyes. This is sufficient to raise a suspicion of blindness from amaurosis or defective sensibility of the optic nerve.

This suspicion will probably prove too well founded if the eyeballs are at the same time smaller or larger than natural, or if they have a rolling motion in the sockets.

If, however, the eyes are otherwise healthy looking, and especially if the pupils contract naturally under the in-

fluence of the light, the child may, in the course of some months, come to give more and more evident signs of gaining strength of vision, which by the end of the first year may appear perfect.

When the eyes are much smaller than natural, there is no hope of sight being acquired.

A larger size of the eyes than natural sometimes occurs at birth, and is called dropsy of the eyes. The cornea in such cases, besides being unusually large, is opaque or cloudy. There appears to be at the same time defective sensibility of the retina. In a few instances the cornea has, with the growth of the child, become clear and some degree of vision been acquired.

Congenital Imperfections of the Eyelids.—Congenital imperfections of the eyelids occur, such as defective power of raising the upper eyelids, a state of matters occasionally met with in several members of the same family.

Children are sometimes born with eyelids grown together at their edges.

Moles or mother's marks of different kinds occasionally occur on the white of the eye or on the eyelids, and require to be particularly attended to by the medical man.

Protection of the Eyes of Infants.—The eyes of infants should always be guarded from exposure to strong light. Especial care should be taken not to bring an infant suddenly from the dark into a bright light.

Nursemaids are often seen carrying their infantile charge with the eyes fully exposed to the sun's rays, and even stand a long time gossiping with other nursemaids notwithstanding the child may be giving expression, by cries

of distress, to the suffering it is undergoing from the exposure of its eyes to the light.

Toys should not be held close to the eyes of infants; nor should cap-strings, side knots of ribbons; and any bright object about the bed or cradle, or light calculated to attract the eyes, be allowed to remain, for fear of the infant acquiring a habit of squinting.

The eyes of infants while sleeping should be guarded from flies by gauze curtains to the cradle.

Infancy and Childhood, or period from the commencement of teething up to about the eighth year.

Phlyctenular Ophthalmia.—From the commencement of teething till about eight years of age, children are subject to an inflammation of the eyes usually attended by excessive intolerance of light, so that they cannot look up.

Out of one hundred cases of inflammation of the eyes in children at that time of life, it has been estimated that ninety are of this kind. Now, when we reflect how readily the disease leads to impaired sight, how obstinate it is, and how prone to relapse, the importance of palliative and preventive measures may be conceived, especially as much may be done to mitigate its attacks, if not ward them off altogether.

In children affected with this ophthalmia, there is usually a disordered state of the general health. The digestive organs and skin especially are found out of order. Besides the inflammation of the eyes, there may be eruptions about the head, sore ears, running from the nose, &c.

The disordered state of general health, of which the inflammation of the eyes under consideration is so often an

accompaniment, is much dependent on an original delicacy of constitution of the child, but to a very great degree also on the diet, regimen, and weather.

Want of mother's milk during infancy, improper diet afterwards, impure air, insufficient clothing are some of the predisposing causes of the complaint, whilst our variable climate powerfully aids their operation. We see the effect of the weather in the rapid changes this ophthalmia undergoes when it suddenly becomes either cold and wet, or dry and warm; all the symptoms being aggravated in the first case and ameliorated in the latter.

The first attack of the disease often comes on from the irritation of teething, after the measles, from cold, &c.

The preservation of the general health, as far as possible, by simple nourishing diet and comfortable clothing (flannel next to the skin,) tepid or cold bathing, friction of the skin, well-ventilated and moderately lighted nursery (the best-ventilated room in the house should be selected for the nursery,) and regular exercise in the open air, constitutes the most important preventive of this ophthalmia.

When the disease has once occurred, and there is a great tendency to relapse, removal from town to country, or to a more sheltered situation, or even to a milder climate will often be advantageous. A dry, warm, inland situation is, perhaps, preferable to the sea-side, the glare from the sea being apt to operate unfavorably.

An actual attack of the disease should be most carefully attended to, as neglect is very apt to lead to great injury of the eye and sight.

Every new attack renders the eyes useless for a long time at least, breaking up the health still further, and

spoiling the temper of the child, to say nothing of interrupting the education.

Blear Eyes.—This is the result of an inflammation chiefly affecting the edges of the eyelids, which has suffered frequent relapses, or never been properly treated.

The inflammation of the edges of the eyelids originates under somewhat similar circumstances as the preceding, and requires to be guarded against by similar means.

Care and management of the Eyes during Childhood.—Children should not be permitted to sit up late, nor to fatigue the eyes by attempting to read, draw, sew, or the like, by candle light.

They should be accustomed to rise early, but only after a good long night's rest.

Even when the eyes are impatient of light, the child ought not to be confined to a dark room, nor forbidden to go out in fine weather. When the child does go out, the eyes should be protected from the light by a bonnet-front shade.

It is at this period that attention is often for the first time, or at least more particularly, drawn to congenital defects of sight. Defective sight from congenital cataract in a less degree, for example, which may have hitherto remained undetected, is now often taken by the friends of the child for short-sightedness.

Youth and Adolescence.

Inflammation of the Cornea.—There are two forms of this inflammation; one characterized by great intolerance of light like phlyctenular ophthalmia,—the others not so much so, if at all.

The persons affected are usually of a constitution and state of health similar in many respects to what is above indicated in the cases of phlyctenular ophthalmia and blear eyes. The inflammation is equally, if not more stubborn and dangerous to the sight. The prevention and general management, therefore, are in principle, the same.

Females are, perhaps, more frequently the subjects of this inflammation, and in them when, about the age of puberty, there is often disturbed menstruation. Under such circumstances, peculiar attention is requisite. Amongst other precautions, the patient should not be bound tightly up in stays.

Anterior Internal Ophthalmia.—Iritis, or inflammation of the iris, is sometimes met with at this period of life—perhaps as an extension of the inflammation of the cornea. Depending on the same state of constitution and health, and excited by the same causes, it is to be guarded against by similar means.

Posterior Internal Ophthalmia.—Dimness of sight, in a greater or less degree, is the symptoms which generally first seriously attracts attention. Fixed muscæ, photopsy, headache, and intolerance of light, may or may not be precursors or accompaniments.

This form of posterior internal ophthalmia is met with principally in young adults of delicate constitution, more frequently females than males, and is commonly attributable to over-use of the eyes, with neglect of exercise, derangement of the stomach and bowels, disturbed menstruation, &c.

The prognosis is unfavorable; in the more advanced stage, very much so.

Care and management of the Sight in Youth and Adolescence.—It is at this period of life that the eyes come to be used in earnest, and defects of sight, which may have had their source in the earlier periods of life, now more particularly attract attention, or become more fully developed.

In many cases defective sight is, for the first time, occasioned by overwork of the eyes.

Excessive use of the eyes about this period is especially apt to render them asthenopic, that is incapable of maintaining their adjustment for near objects, as in reading or sewing, for any length of time, p. 86.

Glasses for short-sightedness are now often for the first time required, p. 73.

Far-sightedness is sometimes met with in young persons after recovery from a fever, influenza, &c. Such cases should not be neglected, nor should those occurring under similar circumstances, in which the sight is dim for both near and distant objects, and in which, though the former are seen best, the sight is improved by convex glasses.

Adult Age.

Catarrhal, Rheumatic, and Catarrho-rheumatic Ophthalmia.—Persons of any age, of either sex, and otherwise healthy, may, by exposure to cold, be attacked by a catarrhal ophthalmia—a prominent symptom in which is as if there were some particles of dust in the eyes. An inflammation resembling rheumatism in its accompanying pain and its exacerbations, as also in the constitutional symptoms, inflammatory fever, derangement of digestive organs, and in its causes, predisposing as well as exciting, occurs only

in adults, though more rarely than catarrhal ophthalmia, and than another inflammation partaking of the characters of both catarrhal and rheumatic.

Iritis, or inflammation of the Iris.—The causes of iritis are various; but their effect, if neglected or mistreated, is closure or obstruction of the pupil, whereby the light being stopped on its way to the retina, sight is prevented. In a large proportion of cases, if not in all, this fatal effect may be obviated by proper and timely treatment. But in numerous cases there is neither timely nor proper treatment. Notwithstanding the pain around the eye which so often attends the disease, the patient not only does not apply for assistance sufficiently early to prevent the obstruction of the pupil, but perhaps uses some irritating eye water which only makes things worse. It is to be confessed, however, that in some cases of injured or destroyed sight from this cause, the medical man has been at fault. He has not recognized the true nature of the inflammation, but mistaking it for an external inflammation, such as catarrhal ophthalmia, he has merely ordered some stimulating eye-water, which has only aggravated the inflammation and hastened it on to its-much to-be-dreaded result of contracted or closed pupil.

The most common form of acute iritis is that connected with a rheumatic habit of the system.

The common exciting causes are: injuries; over-exertion of the sight, which may act as both predisposing and exciting cause; exposure of the eyes to too strong light and heat; exposure of the body to cold. Both eyes usually become affected.

Relapse is very frequent; but the earlier and more com-

pletely the first attack has been subdued, the less liability there is to relapses.

Prevention of relapse.—A person who has once suffered an attack of iritis should carefully guard against sudden transitions from heat to cold, violent exertion, late hours, much reading and writing, and, at the same time, attend strictly to his diet. Sea-bathing is often useful in strengthening the system against the susceptibility. When a person has become liable to relapses, residence in a southern climate during two or three successive winters may be the means of saving him from his dreaded attack and breaking up the tendency.

Turn of life.

Inflammation of the Eyes.—The eyes require still to be guarded against the inflammations above described as occurring in adult age.

Presbyopy and choice of spectacles.—The turn of life is the time when people most commonly find themselves compelled to have recourse to spectacles on account of presbyopy or long-sightedness. See "Far-sightedness," p. 77.

Amaurosis.—About this time, also, those who have suffered at an earlier period from repeated attacks of ophthalmia, or who have for a long time over-exerted their eyes, are liable to a greater or less degree of impairment of the sight from diminution of the sensibility of the retina.

Altogether, the turn of life is a critical time for the sight as well as for the system generally. We ought, therefore, to endeavor to avoid, as much possible, every unnecessarily prolonged exertion of the eyes in reading or other minute work, especially by artificial light.

Old age.

Arthritic or gouty Ophthalmia.—Persons liable to become affected with this inflammation of the eyes have often been long subject to derangement of the digestive organs and internal congestions.

The eyes have seldom been previously altogether sound. The person has been subject to a sensation of fulness in the eyeballs, appearance of sparks of fire before the eyes, and even temporary attacks of blindness, in consequence of stooping, becoming heated, &c.

In persons in the condition of general health, and with the state of eyes just described, ophthalmic inflammation induced by any common occasional cause is prone to assume the form of arthritic posterior internal ophthalmia.

As more special causes, may be mentioned, suppressed gout, anxiety and mental distress, suppression of hemorrhoids, the suppression of any other habitual discharge, continued over-exertion of the eyes, strong light, cold, excessive use of tobacco, spirit drinking.

Presbyopy and change of Spectacles.—Long-sightedness which commenced about the turn of life is usually found to have increased in old age, requiring spectacles of a higher power. Sometimes not only a pair for reading with, but also a pair for viewing distant objects is necessary.

Cataract.—Common, hard lenticular cataract is now of frequent occurrence. See "Cataract of old persons," p. 48.

Glaucoma and Amaurosis.—At this period, sight is often irremediably lost from glaucoma or green cataract

and amaurosis, which perhaps has been coming on gradually for a long time.

Under such circumstances, a sudden attack of gouty inflammation of the eyes destroys the sight in a few days, or even a single night.

Persons at this period of life, who are at all predisposed to inflammation of the eyes, ought to be particularly careful in guarding against the causes of gouty ophthalmia above mentioned.

CHAPTER II.

PRESERVATION OF THE EYES IN CERTAIN GENERAL DISEASES, &c.

Preservation of the Eyes in Measles, Smallpox, Scarlet-fever, Hooping-cough.

THE eyes are liable to suffer from inflammation in these diseases, especially the two former.

Although, in general, the ophthalmia subsides with the general disease under very simple treatment, it should be as carefully watched as if it were an idiopathic or independent inflammation. By neglect, very serious or irretrievable injury to the eyes may accrue.

The particular forms of inflammation liable to arise in, or to which a tendency is apt to be left by, measles, scarlet-fever, and hooping-cough, are phlyctenular ophthalmia, the inflammation of the edges of the eye-lids, ending in blear eyes, inflammation of the lachrymal passages, with watery eye,—sometimes iritis.

In the course of the general disease, the eyes should be guarded from strong light, and bathed occasionally with tepid water.

During convalescense, especial care should be taken to guard against exposure to cold.

Variolous ophthalmia, or inflammation of the eyes in

smallpox, is generally a much more severe and dangerous inflammation than that occurring in or supervening on the other diseases above mentioned, as used to be exemplified with such lamentable frequency before the general introduction of vaccination. Even yet we occasionally meet with cases of smallpox in which the eyes are destroyed. In smallpox, not only is a tendency left to phlyctenular ophthalmia, blear eyes, disease of the lachrymal passages, &c.; but the eyelashes are often partly lost and partly turned in against the eyeball.

As a prophylactic measure during the eruptive stage, any matter which collects at the borders of the eyelids, is to be frequently washed away by means of tepid water; and, after each ablution, some mild salve is to be smeared along the borders of the eyelids.

The eyes are not safe even after the smallpox-pustules over the body have subsided, and the scabs fallen off. On the contrary, then is the chief danger to the eye, by abscess and destruction of the cornea. This generally occurs about the twelfth day of the eruption, but sometimes as late as five or six weeks after recovery from the primary disease.

In such a case, medical assistance is indispensably necessary.

Preservation of the Eyes after Fevers.

In great exhaustion, after typhus or yellow fever, abscess of the cornea occasionally occurs.

Amaurosis is not an uncommon effect of fever.

In a fever which has prevailed at different times in Dublin, and which prevailed very extensively in 1843 and

1844 in Edinburgh and Glasgow, an internal inflammation of the eye with amaurotic symptoms frequently supervened. It occurred chiefly in young adults, and its onset was generally traceable to some such exciting cause as exposure to cold, using the eyes too early after recovery from the fever, &c.

Over-work during convalescence from influenza is apt to bring on muscæ volitantes and even amaurosis.

Preservation of the Eyes in Child-bed and Suckling.

A most dangerous inflammation sometimes attacks the eyes in the fever of child-bed; but considering the grave nature of the principal disease, the affection of the eye constitutes but a comparatively secondary consideration in the case.

Amaurosis is apt to come on after great losses of blood in child-bed.

The eyes and sight are very often much debilitated by prolonged suckling.

Preservation of the Eyes in Venereal Diseases.

Both gonorrhœa and syphilis are a source of dangerous and often destructive inflammation of the eyes.

A most dangerous inflammation of the eye,—one indeed which is often rapidly fatal to the sight,—is a purulent ophthalmia, occasioned by the accidental application of the matter of gonorrhœa to the eye.

The matter is sometimes accidentally applied to the eye of a healthy person through the medium of foul cloths, &c. It is in this way that children are sometimes inoculated. I

have seen a little girl have her eye destroyed by the disease, having been inoculated by washing her face with a cloth which her worthless father had been using in wiping away his gonorrhœal discharge.

Inoculation with the matter of gonorrhœa* is not unfrequently the cause of the ophthalmia of new born infants, when the mother labors under that disease at the time of her confinement.

A person who has suffered from gonorrhœa often remains subject to severe attacks of rheumatism. The eyes, under such circumstances, sometimes suffer from inflammation of the iris, which presents the ordinary character above noticed under the head of iritis. This disease of the eyes is very liable to relapse, and by neglect or mismanagement often ends in much impaired or lost sight.

The inflammation of the eyes arising, as a secondary effect, from syphilis, is most generally an iritis of a very severe and dangerous character.

The constitutional disease appears to be in some cases the exciting as well as the predisposing cause; but in other cases, the iritis is excited by exposure to cold, over-use of the eyes, &c., which should therefore be avoided as much as possible by a person in a condition rendering him liable to be attacked.

Prevention of the spread of contagious Ophthalmia in barracks, schools, workhouses, &c.

The matter from an eye affected with purulent ophthalmia, if applied to a healthy eye, will excite a similar in-

* Inoculation with the matter of whites is a more frequent cause.

flammation. Such a communication by contact has often taken place from the use in common of towels, basins, &c., and so an ophthalmia has spread from one person to another. Without actual contact with matter, contamination of the air, by having matter dissolved in it, is a very common mode of propagation. Thus, when large bodies of people are crowded together, especially in dark, dirty, damp, ill-drained, and ill-ventilated dwellings, contagious ophthalmia is apt to break out. This is the explanation of its propagation in armies, schools, workhouses, prisons, &c. The original cause of this disease was at one time supposed to be a peculiar contagion, first imported into Europe from Egypt (hence the epithet Egyptian,) by the English and French armies. It is now, however, pretty generally conceded, that the disease does not depend on any such peculiar contagion, but that it may arise from occasional atmospherical influences, sometimes in isolated cases, sometimes epidemically. There are also local influences which render the disease endemic in many other places besides Egypt.

The disease, in a more or less latent state, is very common among the lower classes of Irish.

When the disease is prevalent among a number of people necessarily collected together, the healthy should be immediately separated from the diseased, and the eyes of the healthy should be inspected daily.

Amongst soldiers, the predisposition is occasioned by their exposure on guard, their crowding in barracks not over-clean or well-ventilated, drinking, improper clothing—especially tight collars and heavy caps.

About twenty years ago the disease was very prevalent in the Belgian army. By the discharge of the diseased

soldiers, and their return to private life, the ophthalmia has been propagated among the lower classes of civilians in Belgium.

Prejudicial influence on the Sight of the excessive use of Tobacco.

Without a disposition to congestion of the eyes, the use of tobacco operates most injuriously on the sight. Persons affected at an earlier age than usual with glaucomatous amaurosis, or that state of the eyes in which inflammation from any occasional cause is apt to assume the gouty character and rapidly destroy sight, I have often found to have been long addicted to an excessive use of tobacco and sometimes spirit drinking.

PART IV.

INTRODUCTION.

THE DEAF AND THE BLIND.

It is a great calamity to lose either the use of the eye or the ear. The loss of the first in early years, can be made up by the valuable instruction now received at our blind Institutions, and so of the second in the admirable asylums for the deaf and dumb, found now throughout the length and breadth of this favored land, due to the labors of. Gallaudet, Clerc, Wilde, Peet, Hutton, and other truly philanthropic men. In the adult male or female, the loss of either of these senses will be felt more or less a calamity in proportion to the habits and taste of the individual; if fond of music, the loss of the eyes would be a matter not so distressing as the loss of the sense of hearing, but if the individual is fond of the fine arts and painting, the loss of sight to him would be the most severe punishment that could possibly befall him.

No better illustrations of these two conditions could be found on record than that of Milton the poet, and Beethoven the musician. Milton, in one of his most beautiful passages of his Paradise Lost, thus expresses his feelings when lamenting his blindness, but in another passage rejoices in the other senses which are left him:—

——"With the year
Seasons return; but not to me returns
Day, or the sweet approach of even or morn,
Or sight of vernal bloom, or summer's rose."

But in another passage he tells us—

"That though his eyes their seeing have forgot;
Nor to their idle orbs doth sight appear,
* * * * * * *
* * * Yet I argue not,
Against Heaven's hand or will, nor bate a jot
Of heart or hope; but still bear up and steer
Right onward."

"Contrast with Milton an equally great genius, Beethoven the musician, who in the prime of life had the misfortune to lose his hearing, and could find almost no alleviation of his misery, in gratifying the senses which remained. Gloom, anguish, and often the blackest despair, darkened all his later years onward to the tomb."

"Those who are born, or early become deaf, are far more isolated all their lives from their hearing neighbors, than the blind are from those who see. The blind as a class, are lively and cheerful; the deaf are shy and melancholy, often morose and suspicious; and naturally so, for our interest in each other far exceeds, and ought to exceed our interest in the world, and from all this human sympathy, the deaf are almost totally cut off; whilst the blind, excused from many duties which the seeing only can discharge, are peculiarly free to indulge in gossip with their more favored neighbors, and can largely exchange opinions with them. Moreover, the blind can scarcely fail to find their own tastes suited in some portion of the talk of their neighbors, and may thus gratify their inclinations to a considerable extent; whilst the deaf, unless they have

a great aptitude for such occupations as employ the eye and the hand, are far more narrowed in their circle of studies, and are much more solitary than the blind. No one has illustrated this so touchingly as Dr. Kitto, in his striking book on the 'Lost Senses.' When referring to his never having heard the voices of his children:

"If there be any one thing arising out of my condition, which more than another fills my heart with grief, it is *this;* to see their blessed lips in motion, and to hear them not; and to witness others moved to smiles and kisses by the sweet peculiarities of infantile speech which are incommunicable to me, and which pass by me like the idle wind."

Dr. George Wilson, of Edinburgh, from whose work on "The Five Gateways of Knowledge," the above quotation is taken, goes on to say, "That Dream Land is a silent land, and all the dwellers in it are deaf and dumb." The principal of one of the largest Deaf and Dumb Institutions in the country, in a letter to me when I desired his opinion in regard to the loss of the eye or the ear, which was the greater calamity, remarks, "I agree with the author in giving the preference to the ear over the eye. As to dream land, I believe the mute exercises the same machinery for thinking, that he does in his waking hours.

"If more or less educated, he thinks by signs and by letters, if not he thinks as he does when awake, very imperfectly, but by the recalled phantoms of things, scenes, &c., that he has seen.

"As to ourselves, we have an idea of sounds when we do not hear them in our waking moments; we have the same idea of sounds in our dreams. He thinks all in

dream-land are deaf and dumb. But these are only so in the same way that the actors of our waking thoughts are deaf and dumb, and in no other sense."

CHAPTER I.

DISEASES AND ACCIDENTS TO WHICH THE EAR IS SUBJECT.

DEAFNESS is of various grades from the loss and non appreciation of the faint and low sounds, to the most complete and total loss of hearing. The causes are various, the chief of them are as follows: cold and moisture, blows and falls, which are classed as local causes. The general causes are Parasites, Diathesis or Disposition of the body, Gouty, Syphilitic, Scorbutic, Rheumatic, Cancerous and Tuberculous. Fevers, Intermittent, Typhoid, Typhus, Scarlet Fever and Measles. It is more frequent in the male than the female; this may be accounted for, as the male is more exposed to the vicissitudes of the atmosphere than the female. According to Wilde, out of two hundred persons affected, 101 were males and 99 females. Dr. Triquet* states, that of two hundred cases of disease of the ear, 126 were males, and 74 females. Age has considerable influence as a predisposing cause. Of two hundred persons from five months to thirty years 116, and from thirty years to seventy-three years', 78 cases of disease, in all 194. In 6 cases of polypus, ages not given. Total, 200 cases. In 44 of the cases diseases of the ear were hereditary or communicated from progenitors. In one family which has come under my observation, three members of it are deaf; one of the predisposing causes of

* Traite Pratique Des Maladies De Loreille, Par Le Docteur E. H. Triquet. Paris, 1857. p. 58.

it is the too close consanguinity of parents; this question has been set at rest by the results of the Irish census, for out of "100 instances in which the parents were related in the degree of first, second or third cousins, 86 children were born deaf and dumb, and 6 acquired it of one mute in a family; 4 of these were dumb only; and 4 were dumb and idiotic." M. Meniere, physician to the Imperial Institute for the deaf and dumb at Paris, considers this infirmity where congenital, more often referable to this cause than to any other. Dr. S. M. Bemiss has made this subject the object of careful inquiry, and he states, that "his inquiries have not, thus far, led to similar conclusions; but its great frequency among the offspring of such marriages cannot be doubted." A writer in the National Intelligencer, some years ago stated, that "a great proportion of the asylums for the deaf and dumb, the blind and idiotic, are found to be the product of the intermarriages of cousins."*

The diseases of the ear in regard to frequency, may be classed as follows: in 200 cases of disease of the ear in the city of Paris.

1st.	Abscesses in the tube of the ear and skin,	9
2d.	Accumulations of cerumen (or wax,) .	7
3d.	Ear ache, ...	3
4th.	Catarrhal Inflammation, (the result of cold,)	49
5th.	Scrofulous Inflammation, . . .	22
6th.	Inflammation of the Internal Ear, (fevers,)	22
7th.	Polypus of the Ear, ...	36
8th.	Nervous Deafness, ...	52
	Total,	200

* On the Evil Effects of Marriages of consanguinity.—*N. A. Medico Chirurgical Review.* January, 1857 p 102

Toynbee's Classification of Diseases of the Ear.

The following are some of the results obtained by Mr. Joseph Toynbee, of England, who commenced in the year 1839, a systematic study of Diseases of the Ear, by careful dissections, and which now (1857,) amount to 1,659. They are classified in his descriptive catalogues,* as follows:

I. Diseased ears of deaf persons, the history of whose cases are known to him, . .	272
II. Diseased ears of deaf persons, the history of whose cases are unknown to him, . .	223
III. Diseased ears, to which no history was attached, ...	654
IV. Healthy ears, ...	510
	1659

He then briefly states the results to which his careful and elaborate dissections have led.

I. The discovery of the existence of osseous tumors n the external meatus and their structure.

II. The detection of the presence of molluscous tumors in the external meatus; a disease which in consequence of the accompanying discharge of mucus, has hitherto been confounded with "otorrhœa."

III. The abolition of the terms "otitis and otorrhœa," and the substitution of names indicating the tissue affected, and the peculiar nature of the affection.

IV. The discovery of the existence of the dermoid layer of the membrana tympani which plays so important a part

* A Descriptive Catalogue of the Preparations illustrative of the Diseases of the Ear, in the Museum of Joseph Toynbee, F. R. S. London. 1857.

in the diseases of that membrane. It was previously supposed that the epidermoid layer was in direct contact with the fibrous layers.

(That the healthy membrana tympani consists of five laminæ, which commencing externally, are as follows:—The epidermis. The dermoid layer. The radiate fibrous layer. The circular fibrous layer. The mucous layer with its epithelium.)

V. The ascertaining of the true relations of the two fibrous laminæ of the membrana tympani, and the existence and offices of the "tubular tensor tympani ligament."

VI. The construction and application of the artificial membrana tympani in cases of perforation or destruction of the natural membrane.

VII. The demonstration that the functions of the ossicles are analogous to those of the iris of the eye, modifying the access of sonorous vibrations as the latter does the undulations of light, attuning the labyrinth for the reception of either loud and harsh, or very low and very delicate vibrations.

VIII. The establishment of the existence as a disease of membranous and osseous ankylosis of the stapes to the fenestra ovales, one of the most common causes of deafness.

IX. The proof that the Eustachian tube remains always closed, except during the momentary act of swallowing, when its muscles cause it to open.

X. The use of the "otoscope," as a means by which the condition of the Eustachian tube may always be diagnosed without the use of the Eustachian Catheter. The

otoscope is a gum elastic tube eighteen inches long, one end of which is placed in the patient's ear, and the other in the ear of the surgeon.

XI. The various diseases which give rise to caries of the petrous bone, and implicate in their progress the dura mater, the cerebrum and the cerebellum have been described, their nature and extent indicated, and means for their amelioration suggested.

"In conclusion, it has long been the opinion of medical men, that the successful prosecution of aural surgery was opposed by almost insurmountable obstacles. Without, however, attaching any undue weight to the results to which pathological research has already led, may it not reasonably be expected that the same energy and patient, persevering inquiry which have so successfully surmounted obstacles—surely not less formidable—in other branches of the profession, will in this also, be rewarded by discoveries calculated to advance medical science?"

The Preservation of the Health of the Ear.

Prevention.—Having in a brief manner spoken of the nature and causes of deafness, we will pass to the consideration of the prevention.

The neglect of the health of the ear is one of the most serious difficulties which we have to contend with, for notwithstanding its delicate structure and important function, the most simple rules of prudence in regard to the care of it, are sadly neglected.

If we would but consider for a moment its delicate mechanism, the tiny bones which conduct and modify sound, its almost spider web-like membranes, perilymph,

and endolymph put into motion with the most feeble sounds in nature, and resisting with all the force possible the loud report or shrill whistle, and this not only for a time, but continuously with no interval of rest from birth to death, always on the alert, for when the eye closes by the curtain nature has so wisely given, the ear is never closed, never slumbers, never sleeps; it is on this account more exposed than any other organ to derangement and disease, and should be, therefore, better cared for than any other.

Cleanliness.—This is all important to the ear, as it prevents the propagation of parasites, and also the skin of the ear, with its delicate glands, from taking on unhealthy action followed by inflammation, thus extending into the interior of the ear. Many persons think it necessary to cleanse the face and neck, but neglect the ears, and this is especially so in children. The ears should be cleansed daily with a soft sponge or towel, the sponge or towel being introduced into the ear with care; but there is no necessity for any sharp body being employed, as they are apt to injure the delicate, lining membrane of the ear, and in some instances causing perforation of the membrana tympani.

Another very prolific cause of deafness is cold, or variations of temperature, as in sitting or sleeping opposite a broken window, or being immediately under an open window, or in riding in a carriage or railroad car. Nurses are very apt to carry young children to the window, and dress them opposite a crack or opening; the cold air from the window causes acute inflammation, which often ends in permanent deafness. Much care should be taken so

as to protect the ears during windy weather, and care should be taken to protect it during riding in cold and damp weather in an open carriage.

Scarlet Fever.

According to Mr. Wilde, one of the most careful observers on this subject, scarlet fever, as manifested by the extension of the inflammation from the throat to the ear, is one of the chief causes of deafness; and he censures physicians for their want of attention to the state of the ear in scarlet fever, neglecting the application of remedies for a disease which is, even in the unhealthy condition which the patient usually is at the moment, amenable to treatment, and the omission of which has, in numbers of instances, led to permanent deafness, and when the patient is young, to consequent muteism. "That I am," he observes, "not overstating the case, may be learned by any person who will examine the records of our deaf and dumb institutions, or inquire into the causes of acquired muteism. Thus, from the latest Continental table, that published by the Belgian government in 1847,* we learn that of 1,892 cases of acquired muteism from all causes, 216 were from scarlatina, 80 from measles, and 28 from small-pox. From the American tables, out of 86 cases of non-congenital muteism, as many as 41 were from scarlatina;† and according to the investigations of the Census Commission‡ in Ireland, in 394 cases of specified causes of acquired muteism, in thirty-five instances it arose from

* See Dr. Lauveur's Investigation.

† American Annals of the Deaf and Dumb.

‡ See Report of Irish Census Commission.

scarlatina; and the results of the writer's investigations in regard to the Philadelphia Institution, will be found in the article on Otorrhœa.

It will be seen that this is a fearful cause of deafness, and one that every parent should watch with the greatest anxiety, to prevent his child from acquiring. In spite of the doctor's advice, nurses, and even indulgent mothers, will allow their children, suffering from this disease, to look out of a window, or get out of bed too soon, and thus the ears will become worse, or the child will take cold in the ear; they are also apt to neglect to wash the ears out because the child is not willing, or they deceive the physician in not giving the medicine ordered, or see that the gargle or wash for the throat is properly employed. We, ourselves, have often suffered in this way, and in some instances have seen the most fatal results ensue from neglect in following out the most simple directions, on account of the unmanageable nature of the child, all arising from the want of proper authority of the parent.

Typhus and Typhoid Fever

Are a cause of deafness, this however being rarely prevented by any care on the part of the physician or patient, as it is generally the result of an affection of the brain; but in some rare instances the affection is inflammatory, and should be combated by antiphlogistic remedies and counter irritations, and not left to nature, because in children it may produce deaf-dumbness.

Measles.

I have already spoken of this, in connection with Scarlet Fever, as a cause of deafness; this also, requires the

watchful care of both physician and parent for, if neglected in the early stages, it often causes much destruction of internal parts of the ear, if taken in time is very amenable to treatment by cleanliness, a few leeches or a small blister kept up for some time; and if there is much discharge the use of some mild astringent wash with the internal use of a tonic.

Influenza.

I have treated of influenza under the general cause of cold, as it is often simply a catarrh or slight inflammation of the pharynx and bronchial mucous membrane, but if neglected, attacks the ear through the Eustachian tube, passing into the middle ear. As remarked by Mr. Wilde, "many persons will tell you, and especially those who are deaf, 'Oh! I did not think it would signify. I thought it was only a cold, particularly as I had the influenza at the same time.' Yes, the cause was in all probability a cold, or only the influenza, and both are very likely to accompany or be attended by disease of the middle ear."

Scrofula and Syphilis.

These two causes are frequently found to produce deafness for several generations. It is chiefly seen in the light haired, fair skinned and blue-eyed, but it is also found among the dark-eyed and dark-skinned race; our negro or mixed races are very liable to it. The first symptom is attributed to inattention, and the teachers in our public schools are often the first to notice it, and then complain to the child's parents; but as a general rule, it has been the neglect of their not providing the proper clothing, or else the child has been exposed to cold, and

gets a catarrh or cold in the head which is neglected, for unless scrofulous children are carefully watched and clothed, there is great liability to deafness from cold. The other cause is to be treated by the usual anti-venereal remedies, and often requires months and years of treatment to rid the constitution of the hereditary taint.

Bathing.

Sudden diving into the water is one of many causes of deafness, for on account of the sudden pressure of the water, the membrana tympani is ruptured, and from neglect, the hearing is lost; but if care be taken and a deep inspiration immediately before plunging, this would not happen, as the ear is supplied with a counter pressure of air on the inside, by means of the Eustachian tube, just as a drum has its air hole to equalize the pressure within and without. Mr. Wilde also states, that "cold bathing is a much more frequent cause of deafness (by producing slight inflamuation,) than is generally suspected. And we know entire deafness to result as the consequence from neglect of the proper means of cure in such cases.

Deafness may result to the external ear or auricle from pressure against a wall, falls, or fighting with sticks or swords. The operation also for piercing the lobe will sometimes produce erysipelatous inflammation, which may extend into the interior and produce deafness. Occasionally a foreign body gets into the auditory canal and requires removal; if this is performed rudely, it will produce inflammation, which may ultimately end in perforation of the membrane and deafness. Blows on the side of the head and on the ear, will often cause permanent deafness.

The introduction of the finger forcibly into the ear when it is full of water, may cause the membrana tympani to burst.

Loud, sharp reports as from a piece of artillery, or the whistle of a locomotive, or the sudden ringing of a large bell when near the ear, may not only cause temporary, but even permanent, deafness, rupture of the membrana tympani, and hemorrhage from the meatus. "These vibrations act, 1st. By a shock of all the organism; 2d. By the impression they produce on the organs of hearing. The first of these two effects can only result from violent vibrations; very moderate, they produce slight shaking, but the ear loses little by little its tolerance for loud vibrations, and above all for noise. From thence arises an incessant cause of irritation for this delicate apparatus. A violent shock of the ear by loud sounds or great noise, occasions severe disease, such as inflammations, hemorrhages, nervous deafness, tinnitus aurium, and rupture of the tympanum."*

It is stated, that artillery recruits frequently suffer from bleeding from the ears. The late Duke of Wellington suffered from this cause, and having fallen into the hands of a meddlesome surgeon, he was on the eve of losing the hearing of one ear, from perforation of the membrana tympani. The effect of position with reference to a gun, is peculiar, (remarks Surgeon Thornton, in a letter to Mr. Wilde,)—those men who stand nearest the muzzle, feel the report most sensibly; but all who are to leeward suffer more than those to windward. Thus, we should avoid the causes above enumerated; but if it is necessary to be near, we should get to windward of such agents.

* Triquet.

Deafness from Accumulation of Cerumen, etc., in the Auditory Passages.

Western Clinical Infirmary. Service of Dr. Turnbull. (Reported by F. E. Bond, Resident Physician.)

This is one of the most common forms of deafness, arising, as a general rule, from some chronic inflammation and alteration of the ceruminous glands situated within the auditory canal. The following is the course pursued by Dr. Turnbull in such cases: First, the ear is submitted to simple ocular inspection. In many cases it is only necessary to draw the auricle upwards and backwards, whilst the auditory passage is exposed to the light of the sun between the hours of 12 and 2 o'clock, but in other cases it is impossible to discover the mass of wax which is shining, perhaps, in a thin layer on the very surface of the membrana tympani, it requiring the speculum auris of various forms and sizes both as regards the tortuous form, and the great depth and angle at which this foreign body is placed. Cases have come to the Infirmary in which the physician had, after a simple examination of the ear, prescribed something to drop into it, without being able to see the condition of the parts at all, whereas, if the speculum had been used, the cause would readily have been discovered, and the patient saved much distress and discomfort.

April 17, 1858.—First case. Maria Cunningham, aged five years; deafness, with an uneasy feeling in the left ear, caused by catarrhal inflammation with accumulation of cerumen. Directed warm olive oil into the ear for two or three nights, and the ear carefully syringed in the morning, by the resident physician.

21*st.*—The ear has been syringed, and now the curette

is introduced, and wax which is very adherent is broken up and removed. As the skin of the walls of the meatus is red and abraded, three leeches are directed behind the ear, and a wash of plumbi acetat. gr. v to f℥j of water, to be dropped into the ear every night until all pain is gone.

24*th.*—On examination by speculum auris, we find that all the wax has been removed, and the inflammation is almost gone: hearing much improved. Discharged.

August 21, 1858.—Rebecca Dempsey, aged forty years, has suffered from deafness with pain and tinnitus aurium for several months; she thinks it was the result of sleeping opposite an open window. On careful occular inspection of the ears, nothing definite could be seen, but by the use of Wilde's speculum auris, the right ear was found filled up with a brownish mass of soft wax, not adhering to the membrana tympani, except in the middle, as if it had become somewhat loose on its edges. By introducing a curette all round it, elevating it gradually, the whole mass came out, which, after the lapse of almost a month, weighed five grains. Besides cerumen, it consisted of epidermic desquamation and hairs. As soon as it was removed, the patient found that her hearing was improved.

25*th.*—Hearing still improving. On examination, found a small, dark portion not removed. Directed oil to be dropped into the ear, and the resident to syringe the ear.

29*th.*—Not so well to-day. Has pain, with some swelling. On examination, slight fullness and inflammation, from the use of the syringe. Directed cantharidal collodion back of ear, and purgation.

Sept. 8*th.*—Pain still continued, but is not so severe,

swelling all gone, pain more neuralgic in character. Continued blister, and directed ferri. carb. precip. 3 grs. three times a day. Patient did not return.

Dr. Turnbull remarked, that this case shows that syringing should not be persisted in too frequently, especially if the ear is tender, as you may in this way cause an abscess to form, but some warm sweet oil should be dropped into the ear at bed-time, and the syringing repeated in a few days, when all the excitement and congestion has disappeared. In some cases you have an exfoliation of epidermis, or epithelium from the membrana tympani in numerous layers, which being tinged brown, will, in some cases, give the impression to the eye of brown wax, deep in the passage, and time should be given it to be thrown off, and then it can be removed.*

* Medical and Surgical Reporter, Oct. 15, 1858, p. 61.

CHAPTER II.

FOREIGN BODIES IN THE MEATUS.

THE following interesting case will illustrate this subject:—

Margaret ———, aged seven years, brought to one of our public clinics by her father, who stated that a foreign body had been in the ear three days. The professor passed in a probe and struck a hard substance, which he stated to be a stone. He then placed the child's head at an angle so as to get a good light, and endeavored to remove it by means of a small pair of forceps; not being successful, he then bent a silver wire in form of a hook, but still did not remove it, the child kicking and screaming all the while, and requiring the assistance of three clinical clerks. He then administered ether and very soon brought her under its influence; when she became perfectly quiet and still. The Professor then resumed his efforts, which he continued in all some thirty or forty minutes, finally trying to remove it by a grooved director, but all his efforts were unavailing in dislodging it, even using so much force as to bring blood, by lacerating the lining mucous membrane; the case was then discharged, being directed to apply four leeches and to administer ten drops of tinct. opii, and return in a day to his office.

The Dr. continued his efforts in private for several days, even with the assistance of a friend, and it was not until two

weeks after that the foreign body was removed, which was accomplished with an instrument not unlike the wire employed by the dentist in penetrating the canal of the nerve, curved so as to get behind it. He stated to me that there was no perforation of the membrana tympani, and that the patient recovered.

This case is one which conveys a great deal of instruction, and one which a physician may not meet with every day in practice. In the first instance, it was a very difficult case, because three days had elapsed since its introduction. All foreign bodies should be removed as soon as possible, else the pressure and presence of such a body causes pain, swelling, and inflammation, resulting in otorrhœa; and in some instances, from long-continued pressure, the membrana tympani has been perforated.

The second interesting feature about it is, that in ether and chloroform we have agents which entirely prevent the struggling of children, and should be at once employed so as to save the membrana tympani.

The third important consideration is, that in all such cases where the foreign body is small and smooth, like a pebble, the injection of tepid water will often effectually dislodge it by the reflux of the liquid forcing it outwards.

The fourth consideration is, that it is well to lubricate the canal with oil, which will facilitate the expulsion of the foreign body.

It must also be borne in mind that in adults the vertical diameter of the canal is greater than its transverse diameter. Instruments, therefore, should be carried along the inferior wall of the canal in order that they may be insinuated more easily between it and the foreign body.

In infants and young children, on the contrary, the transverse is greater than the vertical diameter, so that an instrument must be introduced accordingly.

The fifth consideration is, that the membrana tympani being inclined from above downwards, and from without inwards, care must be used so as not to force the foreign body into the angle which is formed at the internal extremity of the canal.

Sixthly. When instruments are to be used, the best form are those that are thin and delicate—steel-wire, curved and straight, and reduced to the proper size for the ear; this is to be passed, when flat or straight, to a point beyond the foreign body, and then it is to be turned so as to make a hook of it, and it will, in most cases, answer very well; or, in some instances, if the body is rough, it can be seized by Fabrezi's Forceps, or those of Mr. Wilde, or by the use of the Ear Curette, or a silver wire.

The last and most important consideration is, that we must never in any of these cases employ much force; every thing must be done with the greatest regard to ultimate results, so as not to do more mischief with our instruments than would have happened if after careful and delicate manipulation, we should have to let the foreign body remain.

In the Transactions of the College of Physicians of Philadelphia, 1858, the following interesting case was reported:—

"*August* 4. *Foreign Body in the Ear.*—Dr. CORSE read the following report of a case of this:—

"A little girl, aged seven years, daughter of Simon King, was brought to my office with something in her ear.

She had been to several physicians already, and the meatus auditorius externus was swollen, bloody, and inflamed. On examination by speculum, I was at first inclined to the belief that the parents were mistaken as to the existence of a foreign body in the ear; but they assured me that the object had been distinctly seen, and the little girl said it was a stone.

"On further examination by means of a probe, I could feel a hard body at the bottom of the canal; and on further inquiry, I was informed that her ear had been pulled at very much, and that a considerable amount of blood had flowed from it. I then supposed the membrana tympani to have been ruptured, and that the hard body felt was the petrous portion of the temporal bone, for the probe did not cling to it as to a stone, or bone denuded of its periosteum. I have since been led to suppose that the slippery feel was due to blood coagulated or encrusted on the stone. I made efforts to move the body with a probe, but it was immovable. After a close and attentive examination, I was unable to make up my mind satisfactorily as to the precise nature of the case. The patient having a furred tongue and constipated bowels, I directed a purge and other treatment to keep down inflammation, and ordered the ear to be gently syringed several times a day with luke-warm water, requesting her to return to me the next day

"On their return, they informed me that a stone had been put into each ear while at play; and on examination of the other ear, I found truly a hard, white body near the middle of the meatus. I cautiously tried to get a pair of forceps on it, but it constantly slipped from the grasp, and was soon at the bottom of the meatus. Mortified with my

failure, I ceased my efforts, and directed the parents to return the next day, to continue the antiphlogistic treatment of the inflamed ear, and do nothing at all to the other one.

"I was satisfied there was a foreign body, hard and round, in the ear, which filled the canal, or so nearly filled it that no forceps I was acquainted with could pass down on each side; it therefore became necessary to adapt some instrument to the case, and I drew a diagram of this instrument, which Mr. J. H. Gemrig, surgical instrument maker, Eighth street, below Chestnut, has made for me. It consists of two blades and a fulcrum, the latter being separable from the former. Each blade should be $2\frac{5}{8}$ inches long, $\frac{3}{16}$ of an inch wide, and laterally curved so as to form a segment of a cylinder $\frac{1}{4}$ of an inch in diameter, in order that it would apply to the sides of the auditory canal. The blades should not be more than $\frac{1}{4}$ of a line in thickness. At first glance, this may seem too thin; but when the cylindrical shape is remembered, it is easy to perceive that the strength is thus greatly increased, while the small space we have to operate in renders a thick blade entirely useless. There should be a slit in each blade, at the outer end, $\frac{3}{4}$ of an inch long, and $\frac{1}{2}$ a line wide, for the shank of the button on the fulcrum to slide in. The fulcrum must be adapted so as to be movable, and have a button on each side adjusted to the slits in the blades, and thus secure them, as well as operate as a fulcrum. It must be $\frac{3}{16}$ of an inch in diameter, in order to separate the outer ends of the blades, and at the same time close the inner ones, and by this means more effectually clasp the foreign body. The blades ought to be graduated, in order to know how deep

they can be inserted, lest they be pushed through the membrana tympani.

"In using this instrument in very difficult cases, a blade must be applied anteriorly first, because the anterior side of the canal has a slight convexity, which makes it necessary for the outer end of the blade to be thrown strongly back, in order for it to pass the foreign body if large; then, by straightening it up, the body will be somewhat moved from the membrana tympani, and the danger of injury to it avoided. The other blade may then be applied posteriorly, and not pushed quite as low down as the first one. The fulcrum may then be applied; and to do so, the ends of the blades must be separated, and the fulcrum laid in the hollow and slid down until the buttons are locked in the slits on each side; then making pressure in the middle, with a gentle to and fro movement, the body may be withdrawn.

"In appreciating the utility of this instrument, the shape of the cavity must be referred to. The meatus auditorius externus is described as an ovoidal canal about one inch long and three lines in diameter, part bony and part membrano-cartilaginous, and curved. It is somewhat constricted in the middle, and lined throughout by a membrane, which crosses the internal extremity obliquely and closes it, and constitutes the membrana tympani. The external extremity of the canal is overhung by a part of the external ear. It will be readily perceived that a foreign body of any considerable size, that passes the middle of the canal, will be much more difficult to remove, on account of the narrowing in the middle.

"Dr. Coates remarked upon the difficulty, and the best

mode of extracting foreign bodies from the meatus auditorius. The danger of injuring the membrana tympani rendered all instrumental interference more or less objectionable. He had thought that quicksilver might be employed with caution for the purpose; and he would now make the suggestion, as one of an expedient, at least, worth the trial. A small quantity only should be used, just enough to float the intruding body, without injuriously pressing on the membrana tympani. The only objection that he was aware of, was the possible existence of an opening in the membrane. Such an opening, however, would rarely occur; and might generally be suspected, when present, from previous symptoms which would be ascertained by inquiry.

"Dr. Corse thought that the quicksilver might answer for living insects, and for bodies not firmly impacted. He had removed the latter, and dead insects by means of strong jets of water from a good-sized syringe with a very slender nozzle, in the usual way. Insects, however, on account of the insufferable noise and pain occasioned in the ear, are generally killed with oil, and in dying fasten themselves with their claws, so as to be not easily detached. The quicksilver would be apt to fail in such cases. Dr. Corse then dwelt at some length on the difficulties in the efficient use of the ordinary instruments."

CHAPTER III.

OBSERVATIONS UPON OTORRHŒA AS A SEQUELA TO SCARLET FEVER.

Otorrhœa, or a chronic discharge from the ear, is one of the most frequent and tedious affections which the physician has to treat. It may properly be divided into two great classes, depending on the nature of the discharge, viz: mucous and purulent. The mucous form arises as a termination of catarrhal otitis, from measles, or whooping-cough. Its chief characteristic is the absence of true pus from the discharge, and its being found much more amenable to treatment than the purulent variety, of which we design to treat in this paper. Occasionally we find this second form of discharge difficult to manage in scrofulous patients, when neglected; but if proper counter-irritation be made behind the ear, and great cleanliness of the ear and skin be enforced, with tonics, astringents, and slightly drastic purgatives, it will be found more amenable to treatment than the form depending on scarlet fever. The great importance of attention to this second form of otorrhœa, (chiefly the result of scarlet fever,) will be better understood, when I state that it is the chief cause of non-congenital deafness. This is proven by the records of the deaf and dumb institutions both of this country and of

Europe.* An examination of the reports of the cases admitted into the Pennsylvania Institution for the Deaf and Dumb, in the city of Philadelphia, during the last six years, also proves the same fact. In 1852, of the thirty-three pupils admitted, seventeen were born deaf, three lost their hearing by scarlet fever, the remainder from five different causes, and four from cause unknown.

For the year 1853, of the twenty-six pupils admitted, twelve were born deaf, six lost their hearing by scarlet fever.

In 1854, of the forty-seven pupils admitted thirty-two were born deaf, three lost their hearing by scarlet fever.

In 1855, of the twenty-five pupils admitted, thirteen were born deaf, five lost their hearing by scarlet fever.

In 1856, of the sixty-three pupils admitted, 27 were born deaf, 12 lost their hearing by scarlet fever. In 1857, of the 26 pupils admitted, 11 were born deaf and 4 lost their hearing by scarlet fever. The large number for 1856 may be accounted for, by the fact that in that year the mortality from scarlet fever in Philadelphia was nine hundred and seventy-two in a population of 500,000, while in 1855, the deaths from scarlet fever were only 163. This fever also prevailed throughout the State as an epidemic, during the latter part of the year 1855 and 1856.

Otorrhœa, resulting from scarlet fever, is a disease which, if it becomes purulent and chronic, is very difficult to cure. This, I find to be the opinion of almost every one who has devoted much attention to the subject. Itard† says: "It is of interminable duration, and is one of the gravest dis-

* See p. 169.

† Traite des Maladies de l'Oreille et de l'Audition. Par J. M. G. Itard, p. 203.

cases of the organs of hearing." Mr. Wilde* remarks: "The most unmanageable causes of otorrhœa which I have met with in practice, in which the most destruction has taken place, and where the ossicula have been most frequently lost, have been the result of scarlatina." In my own practice, one case had existed for thirty-five years, in another, twelve years, and a third case, which came under my care, had been more or less under medical and surgical treatment, for seven years. In several other cases, the duration was respectively, one, two, and three years. The most recent cases have been the result of the late epidemic in our city. The profession have not, at any time, been sufficiently alive to the great importance of the treatment of acute inflammation of the tympanum, so as to prevent, if possible, the destruction of the internal portion of the ear, and the subsequent otorrhœa.

If the same amount of care and trouble were exercised by physicians in the treatment of the *ear*, as of the throat, a much smaller number of children would be permanently deaf, and a much smaller number would suffer from destruction of the tympanum, or with chronic otorrhœa for months or years after. Having been successful in most of my cases, during the late epidemic, in preventing deafness, I will give an outline of my treatment, hoping it may save a few children that important organ, the ear, so adapted to increase knowledge, and delight mankind.

Treatment.—In the early stage, when the scarlet fever is at its height, we must endeavor to arrest the acute inflammation of the ear, by depletion, but care must be exercised, as this exanthem will frequently assume a low

* Wilde, p. 323.

type, which was the case during the recent epidemic. In such cases, local depletion (by leeches or small cups, to the mastoid process and antiragus) should be employed as soon as acute pain is complained of, and sometimes it will be found necessary to make pressure, as the child may be too young to indicate the point of pain, except by sudden screaming and crying; but pressure at the lowest portion of the ear will reveal the cause instantly.

Local depletion should be repeated at intervals, and in such quantities as the strength of the child will permit, assisted by active purgation by a drastic agent, as jalap, scammony, or senna in infusion; while, at the same time, we support the child's strength with nourishing diet, &c.

If the case will not bear depletion, or we are called too late, then we must still apply counter-irritation, and purge the patient, but should suppuration have commenced, indicated by a chill, with increased pain, of a darting and throbbing nature, with a sense of bursting in the ear, the meatus, on examination, being of a livid red color, with the membrane of the tympanum red and swollen, our proper plan is to introduce a delicate cataract needle and puncture the membrane. This will liberate the fluid; the purulent matter being pent up in the tympanum, from which it cannot escape through the Eustachian tube, it may ulcerate its passage externally, or may, by its contact, cause destruction of the internal ear, with destruction of the tympanum by rupture, or even extend towards the meninges of the brain, being not only fatal to the organs of hearing, but even to life itself. Cases are on record, in which this ulcerative process has extended, so as to open the carotid artery into the Eustachian tube, causing death from

hemorrhage from the ear. Or the extension to the brain may be in the form of effusion or disease of the periosteum and death from convulsions. But instead of this extension your remedies may have prevented death, and the disease may now take on the subacute form attended with a discharge of a muco-purulent or sero-purulent matter.

The treatment in such cases must be both general and local. The general treatment, which is of the utmost importance, is to improve the blood by tonics of iron, quinine, and cod-liver oil, with the frequent use of the bath, or wet towel, with frictions, and out-door exercise in clear weather. The local treatment should be directed to the throat, by the application of solid nitrate of silver to the region of the Eustachian tube, every third day, with stimulating gargles, and the internal use of weak astringent washes to the ear, while most active counter-irritation should be kept up by blisters, setons, or croton oil, applied over the mastoid region and tonsils. In some of the most unpromising cases the otorrhœa will gradually cease, and the disease may thus be cured; and if the case become chronic, then the treatment must be continued for months, and even years, as may be seen by the record of a few cases.

Case I. *Scarlatina, Loss of Membrana Tympani, Deafness, Otorrhœa.—July* 11, 1856. John B., æt. 10 years, had scarlet fever at the age of three; deafness has ever since prevailed, with otorrhœa on both sides; the external ear in normal condition; meatus, good size; membrana tympani quite gone on right side, while on the left it is thickened with a small opening in its centre.

He is pale, of scrofulous diathesis, with several enlarged cervical glands; nose and throat in an irritable condition. Able to pass air through both Eustachian tubes.

Treatment.—After washing and drying out the meatus, and opening in left membrana tympani, it was brushed over with a solution of nitrate of silver every third day, while internally was administered cod-liver oil and ½ grain of sulphate of quinia in solution three times a day; counter-irritation behind the ear by tincture of iodine.

January, 1857. After six months' treatment, the otorrhœa on left side is quite gone, and the opening filled up, while the discharge from the right is very slight, unless on exposure to cold air, which is much obviated by the introduction of a portion of glycerine on a pellet of cotton, and avoidance of cold winds. The hearing was so much improved that he was able to resume his school duties, requiring no artificial aid.

Case II.—*July* 22, 1856. David R., æt. five years, had scarlet fever at the age of two years and seven months, membrana tympani in part gone; general health not good, pale, anæmic; cleansing and application of solution of nitrate of silver, with the internal use of sulphate of cinchona, one grain, three times a day; and as a local astringent, gr. v cupri sulphas to ℥j of water; and to moisten the meatus with glycerine, in which was suspended acid tannic.

Nov. 1857. Hearing much improved, and discharged improved. (Case did not return.)

Case III. *Scarlatina, Loss of Tympani, Deafness, Rheumatism with Polypus.*—*August* 15, 1856.—William J. M., æt. twenty-eight years; otorrhœa from both ears; had scarlet fever at the age of sixteen; could only hear the tick of the watch when applied over the temporal bone; Eustachian tubes both closed; bent almost double with

rheumatism; right ear, membrana tympani entirely gone, and no malleus visible; left ear filled up with a polypus, covered with yellow pus, and flowing out over the edge of the meatus.

Treatment.—Two grains of iodide of potassium three times a day, with a wash of ten grains zinci sulphas, to be dropped into the left ear. After cleansing with cotton, applied solid nitrate of silver to growths, by means of Wilde's caustic holder. Finding, after several trials during August, not much reduction in size, I twisted off portions, at three different sittings, and, as the hemorrhage was considerable, I applied powdered alum, and again used the nitrate of silver to get rid of what was still at the bottom, but found it did not entirely destroy the spongy granulations, after eight months' persevering trial.

February, 1857. Applied a saturated solution of zinci chlorid., on a piece of cotton, by means of the speculum, for three weeks, with the entire contraction of the granulations, so that now, I can see the membrana tympani, and an orifice from which the whole mass of granulations seems to have sprouted, and as I touch the surface, he feels a disposition in his throat to cough. His general health is much improved, being able to straighten himself, and rheumatism gone.

March, 1857. Dilated Eustachian tube by means of Wilde's catheter and warm air twice, at two weeks' interval. His hearing is so much improved that he can hear me speak to him at a distance of six or seven feet. Gradually the membrana tympani closed over, and he was discharged, cured.

This case was one of great interest, and shows the good

results to be obtained by persevering efforts, assisted as it must me, by the willing help of the patient, and the use of constitutional remedies.

Case IV. *Otorrhœa, of twelve years' duration, of both Ears, with Perforation of Membrana Tympani on one side: Improved.—April* 15, 1857. Benj. D. F., æt. twenty-four; a healthy looking young man, of fair complexion and blue eyes. (Blacksmith.) When he speaks, it sounds as if there was some obstruction in the throat or nose. He stated that he had scarlet fever at the age of about twelve, but of a mild character. On getting well, he had more or less discharge from both ears, and was deaf, and although he has been under the care of several physicians, he has become worse, so that he is unable to attend properly to his duties in his father's shop. On examination with Wilde's speculum, found the right membrana tympani with a small opening in it, but he was not able to pass air through it, from obstruction of the Eustachian tube; there was also redness of the external meatus; hearing distance, one inch; left ear, discharge, with redness, and in places whiteness of of the membrane, but no perforation; able to inflate the membrane on this side; hearing distance, three inches. Throat—both tonsils very much enlarged, but not very hard; relaxation and elongation of uvula, with engorgement. Removed uvula, made application of zinci chlorid., in solution, to tonsils, and directed cleansing of the ear by a syringe, and application of solution of zinci sulphas, with vin. opii gr. x to three ounces of distilled water, three times a day. For internal use, syr. sarsap. comp., with gr. j bichl. hydrarg., a wine-glassfull three times a day, with nourishing diet.

22*d*. Throat of a much better color, and speaks plainer; not much improved in discharge from ear, which annoys him, having to wipe it very frequently through the day, as I directed him to keep no cotton in the ear, but to wash it frequently each day with the wash diluted.

Treatment of the throat continued; applied cantharidal collodion below and in front of the ear, with application of x gr. solution of argenti nitratis to ear, with insufflation of powdered alum to throat and nose.

25*th*. Very much improved. Ordered him solution of iodine emp., ten drops three times a day in infusion of hops.

May 16. Finding the Eustachian tube continued obstructed, introduced Eustachian catheter, and gently dilated it with warm air, which produced a feeling of faintness, but which soon passed off. Same treatment continued.

23*d*. Catheter again introduced, no feelings of faintness being produced. Same treatment.

27*th*. Both ears discharge less. Eustachian tube open, the air passing through it into the middle ear, and being discharged from thence outwards, by the perforated membrana tympani. Hearing improved.

June 3*d*. Had a slight relapse from catarrh; throat more congested; discharge from ear increased; applied solution to the throat, also mild solution to the ear; directed demulcents to be used.

20*th*. Again improving, but is feeble. Ordered tonics, sulphate of quinine, and cod-liver oil.

July 11. Discharge ceased; complains of pain in his head. Ordered blisters behind ears, and an infusion of

senna, to keep up action on the bowels, so as to prevent a return of the pain.

August. Called again at the infirmary, and informed me he was so much improved as to be able to take his place as superintendent of the shop, and when on a recent visit to the river, he could hear the noise of the steamboat, which he had not been able to do for many years.

CASE V. *Otorrhœa of both Ears of five years' duration, with loss of both Membrana Tympani.*—The result of scarlet fever and measles. Mary T., æt. eight years, a delicate dark-eyed girl, is deaf in both ears, with great irritation from profuse purulent discharge, the odor from which is very offensive. Has tried numerous physicians without success. After the acute attack, the father was directed by his physician to syringe the ears, every few days, with tepid water, which he continued, until one day the discharge came through the nose, and the child cried out that something had burst, since which time numerous applications have been tried, but with no permanent benefit.

On a careful examination and removal of the profuse secretion by pellets of cotton, I found both membrana tympani entirely gone, the discharge proceeding from the middle ear. The tonsils were enlarged, the throat red and congested, with several enlarged cervical glands.

I directed simple cleansing of the ear with an infusion of chamomile flowers, several times a day, with a weak lotion of subacetate of lead, to reduce the irritation of the auricle, to be applied with a pledget of lint. Also, a solution of zinci sulphas gr. j to the ℥j of water, applied by means of a small syringe, and then to allow it to flow out.

Directed, also, that her diet should be nourishing, with

the use of cod-liver oil, a tea-spoonful three times a day, with a salt bath once a week.

March 24. To-day, offensive discharge much less, right ear very much improved in appearance. Directed ½ gr. of sulphate of quinia three times a day with the cod-liver oil to be continued.

April 8. Much improved in all respects; discharge still continues; was able to resume school duties.

CASE VI. *Cephalic Otorrhœa the result of Scarlet Fever of three years' duration; Post-mortem.*—Mary H. æt. six years; had scarlet fever severely when three years of age. Was a long time feeble, but her ear was not treated, except to wash and keep it clean.

Towards May, 1857, the child began to complain very much and came to my office. Ordered a small blister, with a solution of one gr. sulphate of zinc to one ounce of water. As an internal tonic ½ gr. sulphate of quinia three times a day. On examination, the right membrana tympani was gone, and there was considerable discharge of unhealthy pus from the ear, showing disease of the bones. Having been benefited by the treatment, she did not return to the office until June 6th, when she was suffering intense pain from catarrh in her head, the discharge being much increased from exposure; being a very wilful child, the parent had but little control over her. I directed counter-irritation to be renewed, with the internal use of an opiate, to relieve pain; did not leech her on account of her feeble state.

Visited her on the 8th. Pain still very persistent, and head bent to the side of the affected ear. Fearing convulsions, ordered four leeches to the back of each ear, with

sedatives internally, opiate fomentations to the ear, and warmth to the feet, baths, &c. In spite of treatment she continued to grow worse, and had a severe attack of convulsions on June 26th, which yielded to leeching and cold applications, but was soon followed by a state of coma.

She died on the 28th of June, but previously had considerable discharge of pus from her nose, and was unable to swallow for a day or two before convulsions set in.

The family being very unwilling to allow an examination, I was only permitted to remove the temporal bone and ear, which I did by sawing a V shaped piece, and removing the ear entire. The coverings of the brain, in spite of her anæmic condition and her inability to take nourishment, were much congested and thickened, with effusion of fluid in the ventricles, with considerable softening of the substance of the brain.

Ear.—The membrana tympani was almost gone, but, strange to state, in the middle ear, although filled up with green pus, and the membrane soft and detached, I found the malleus and incus, which I have in my collection, but on cleansing the two bones they were found ulcerated. The semicircular canals and cochlea were almost free from disease, which had passed from the middle ear to the membranes and brain, causing a low form of inflammation, with softening and effusion, ending in convulsions and death. What seemed very remarkable in this case was the long period which the small bones remained in the ear in spite of the discharge, showing how slowly the ligaments which attach the bones ulcerate; thus accounting for the power of hearing in many persons suffering from otorrhœa; the chain of bones, although ulcerated, yet retaining their place, and

communicating the sound to the nervous expansion of the auditory nerve. She had no symptoms during life, of facial paralysis; the bending of the head to one side seeming to indicate some disease of the top of the vertebræ, but no examination of that part was permitted by the family.

This imperfect paper on otorrhœa, as a result of exanthematous inflammation of the mucous lining of the tympanal cavity, or extension of the same affection from the throat, upwards through the Eustachian tube, I am well aware is not arranged according to the anatomical classification of Mr. Toynbee, the most distinguished authority on this subject, for although I consider his a good one, yet it has its defects in its extreme subdivision of tissue affected. It is still doubtful to my mind how he, or any one else, can determine the precise tissue which is affected in chronic discharge from the ear, more especially at a public clinic, for the time afforded for examination of each case is often so short, the history given so imperfect, that it is difficult from the patient's statement to know what was the primary cause of the mischief; for we certainly cannot, with all the light we can throw upon it, state which of the five layers of the membrana tympani is affected, when, perhaps, it has been for years bathed in pus, mucus, or a substance which resembles very much the curdy matter found in the scrofulous abscesses.

For those interested, I will here give a synopsis of the class of cases met with in my public clinic at the Western Infirmary.

A discharge from the ear will make one-half of my cases arising from chronic inflammation of the external auditory canal, ulceration of the membrana tympani, or disease of

the middle and internal ear. Accumulation of cerumen, causing deafness, or an entire want of it, with inflammation of the glands, occurred in about one-half of all my cases with or without pain and tinnitus aurium. Then follows, in point of frequency, catarrhal inflammation of the auditory passage or middle ear, with mucous accumulations in the Eustachian tube, forming one-tenth of the whole number.

Polypi and fungous excrescences on the auditory passages, or projecting through an ulcerated opening in the perforated membrane. Acute cases of inflammation of the membrana tympani are rare, but chronic cases are numerous, with opacity, thickening, &c., with or without occlusion of the Eustachian tube. This is one of the most difficult diseases to treat if it has been of long standing.

Eruptive affections of the auricle are numerous, as herpes, eczema, &c.

There are certain diseases of the ear which are very rare, namely, nervous deafness, in which the auditory nerve is alone affected.

CHAPTER IV.

ON THE USE OF AN ARTIFICIAL MEMBRANA TYMPANI IN CERTAIN FORMS OF DEAFNESS, DEPENDENT UPON PERFORATION OF THE NATURAL MEMBRANA TYMPANI.*

It will be seen by those interested in this application, that Itard as early as 1821, employed goldbeater's skin as an artificial membrana tympani, to relieve deafness; he also in his work cites a case in which deafness was relieved by the introduction of a portion of cotton wool to the bottom of the meatus, affording proof that his writings and practice were far ahead of his time, and that he was actually writing for posterity. Well might the Academy of Medicine, long after his death, republish a new edition of his works, a compliment rarely conferred upon a medical author. This work of Itard is one of the most complete treatises on the subject of the diseases of the ear, that has ever been written in any language, so full, accurate, learned, and above all truthful. This useful application seems to have remained without utility, until Mr. Joseph Toynbee, of London, tested its merits on the 12th of January, 1852, on a patient named Peter T., who had been deaf for sixteen years, the result of cold, and within six

* On the use of an Artificial Membrana Tympani in cases of deafness, Dependent upon perforation or destruction of the natural organ. By Joseph Toynbee, F. R. S., Aural Surgeon to St. Mary's Hospital, &c., &c. Fifth Edition: London. John Churchhill. 1856.

years had apertures in each membrana tympani with discharge. "Upon examination, an aperture between one and two lines in diameter, was observed in each membrana tympani, and the mucous membrane of the tympani, which was the source of the discharge, was more thickened and red than natural."

The treatment consisted in keeping up counter-irritation over each mastoid process, and in the use of an injection composed of three grains of acetate of zinc, to an ounce of water. Under this treatment, he somewhat improved, but the hearing still remained so defective that he was precluded from following any avocation. In the commencement of June, I experimented on this patient with the first membrana tympani, composed of vulcanized india rubber, and the good effect was at once decided. When it was placed over the surface of the original membrane, so as wholly to close the orifice, the patient made a movement of his lips and said: "I hear as differently as possible from what I have done for many years; everything sounds clear!" This patient went away with the artificial membrane in his ear, hearing conversation perfectly. The following morning he came to my house, saying that he had accidentally moved what I had left in his ear, and he was "as dull as ever." I replaced the artificial membrane—he again heard well; and being supplied with one which he could introduce or remove at pleasure, he has worn it during the day ever since—a space of between three and four months—and he has never complained of pain or discomfort from it. Latterly he has found the hearing so much improved that he has been able to dispense with the use of the artificial membrane for a few hours daily; but he hears much better with than without it.

This patient was shown at a meeting of the Pathological Society of London, in February, 1853; the following is the published report:*—"The artificial membrane having been removed, the members of the Society had the opportunity of observing the perforate condition of each membrana tympani. After the removal of the membranes he could not hear, unless loudly spoken to; but when he had replaced them, which he did with apparent readiness, his hearing was excellent."

Mr. Toynbee in his pamphlet of 32 pages, records 9 cases which were very much improved, and in some of them perfectly relieved. The following is an outline of the cases, the first case having been given in extenso. 2d case, Miss B., æt. twenty-one, each membrana tympani destroyed by measles at four years of age. Hearing restored by the artificial membrane. Very sensitive to sounds. Treatment: an artificial membrana tympani was introduced into each ear. 3d case is from notes of a case by Dr. Shearman, of Sheffield, no age given. The deafness in this case is of nearly twenty years duration, was perfectly removed on the left side, although the whole of the left membrana tympani is destroyed, the false one acts perfectly.

4th case, Miss S., æt. twenty-four. At the age of four, suffered from an attack of scarlet fever. Examination: Right ear. The hearing distance of the watch is half an inch.† The central part of the meatus contracted to half its natural size. Left ear. Hearing distance one inch. *Treatment.*—Passed a small artificial membrana, so as to

* Medical Times and Gazette, February 12, 1853.

† I have used the same watch for many years; the natural hearing distance is three feet.

cover the destroyed natural membrana tympani, caused by a slight tendency to irritation: care was required in the management, but it ultimately did well. Time not stated when first seen. In the middle of February, 1854, the mother of the lady called and stated that her daughter "continued to hear perfectly, and that she was quite an altered person."

Case 5th. Miss G., æt. fourteen. Deafness from scarlet fever during five years. Upon *inspection*, it was found that the membrana tympani in each ear was absent, the membrane of the tympanum was thick and red, and poured out a mucous secretion. An artificial membrana tympani was applied to each ear, and the result was so complete a restoration of the hearing power, that the patient could hear all that was said in different parts of a large room.

Case 6th. Mr. M., æt. twenty-three. Deafness for twenty years from measles and scarlet fever. Greatly improved by the artificial membrane.

Case 7th. Miss H., æt. seventeen. At seven years had a severe attack of scarlet fever, since which time she has had discharge from each ear, requires to be spoken to distinctly in a raised voice. *Treatment.*—Application of the artificial membrane which gave immediate relief, which continued by report from case, one year after application.

Case 8th. S. H., Esq., æt. twenty-one. Between six and seven years of age, had an attack of scarlet fever, since which, at intervals, discharge from each ear. Upon examination, the membrana tympani was found to have disappeared from each ear, the watch was not heard by the right ear, and at a distance of five inches from the left. By the

aid of the artificial membranes he was able at once to hear me talk across my room, and he soon heard general conversation perfectly.

Case 9th. Lieut. L., æt. twenty-seven, has been dull of hearing for fifteen years, especially the right ear; complains of a singing in both ears, but especially in the right. On examination, the membrana tympani was found to have disappeared from the right ear, and the mucous membrane of the tympanum was red; the watch was not heard, unless in contact with the ear. In the left ear the membrana tympani was white, like paper, and at its upper part was a small polypus. Upon the application of the artificial membrane to the right ear, the patient heard well at once, although he never remembers to have heard with it before.

10th Case. N. M., Esq., æt. seventeen and a half. He had measles when young, since which time he has had discharges from each ear, accompanied by so great a difficulty in hearing, that he requires to be spoken to distinctly within the distance of a yard. Upon examination, a considerable orifice was discerned in each membrana tympani. The mucous membrane of each tympanic cavity is thicker than natural. On applying the artificial membrane to each ear, the hearing power was at once restored; he said, that he "heard painfully well, and that his own voice sounded like a trumpet." He soon learned to put the membrane in himself, and he continues to hear quite well.

I will now give Mr. Toynbee's account of the formation and use of an artificial membrana tympani.

"The artificial membrana tympani, made by Messrs. Weiss from directions given by Mr. Toynbee, 'the portion of vulcanized india rubber or gutta percha is about three-

quarters of an inch in diameter, which leaves sufficient margin for the surgeon to cut out a membrane of any shape that may seem to him desirable, and to leave the silver plate (two very fine plates of silver, having a diameter of about three-quarters of a line, between which the rubber is to be placed,) either in the centre or towards the circumference, at his discretion.' He now invariably uses vulcanized india rubber, not much thicker than ordinary brown paper. The silver wire is of sufficient length to admit of the membrane being introduced or withdrawn by the patient, but is not perceived externally except upon special observation.

"A second kind of artificial membrane is made by fixing the layer of gutta percha, or vulcanized India rubber, between two very delicate silver rings, from the eighth to the sixth of an inch in diameter; these rings are riveted together, leaving a portion of the membrane drawn moderately tense in their centre; a margin of the membrane is also left beyond the circumference of the rings, so as to prevent the latter being in contact with and irritating the tube of the ear. To the surface of one of these rings the silver wire is fixed by two branches, and they should be joined so that the outer surface of the rings should look obliquely outwards and forwards instead of directly outward, thus imitating the direction of the natural membrana tympani. This kind of membrane is often preferable to that previously described, if the meatus is sufficiently large to admit of its passage. In some cases, however, it produces a loud noise, as if it were too tense; it would, perhaps, be desirable to have it with only one branch, so that the surgeon may be able to alter the angle of the mem-

brane with the stem, according to the case. A pair of forceps is made whereby the artificial membrane can be more easily introduced and withdrawn.

"In cases where patients require to be shouted to, close to the ear, the artificial membrane will not prove of any service."

I will conclude by the recital of a case of complete perforation of the membrana tympani, in which there being no hope of restoring the natural membrane, an artificial one was substituted with benefit to the patient.

Otorrhœa with Perforation of the Membrana Tympani, with the Application of an Artificial Membrane with Success.—James Riddle, æt. twenty-four years, a native of Ireland, by occupation a silk weaver, applied January 21, 1858, at the Infirmary, on account of a troublesome discharge and deafness in his right ear, from scarlet fever, which he had at the age of thirteen. He has become so deaf as not to hear a watch with the right ear, even when placed in immediate contact.

On examination with a good light, the meatus was found filled up with dry mucus, pus, &c., upon removal of which, by careful syringing with warm water, the membrana tympani was found entirely gone, and the lining membrane of the meatus thickened and contracted. Astringent and stimulating injections were now employed to change and alter the secretion, and he was directed to take five grains of iodide of potassium in an infusion of humuli, three times a day, with counter-irritation behind the ear, by cantharidal collodion, and to cleanse the ear with warm water three times a day.

January 23d. Parts free from accumulation. After

wiping out discharge of pus, &c., a small portion of finely powdered cupri sulphas was blown upon the altered mucous membrane, and a wash of zinci sulphas gr. j to each f℥j aqua, was directed to be employed after washing out the ear.

26*th.* Discharge has moderated, but hearing not improved, not being able to pass air through the Eustachian tube. I, therefore, carefully introduced the Eustachian catheter at two different sittings, and passed air, after some time, through the discharge, so that I could hear the air bubbling by the aid of the otoscope.

29*th.* Same treatment; still improving.

February 9*th.* Discharge still less. Tried the moistened cotton, so as to improve the hearing, but it increased the discharge; although removed and cleansed, the itching was so intolerable, that he removed it, being unable to bear it, and again resorted to astringent and stimulating applications to moderate the discharge.

12*th.* Introduced an artificial tympanum of vulcanized India rubber, made by Mr. Kolbe, of this city, which gave him no pain, and his hearing was improved.

15*th.* The discharge is again on the increase, and has blackened the silver wire, and caused the India rubber to wrinkle and change its color, so that it was removed, and the ear allowed to rest.

18*th.* Is very comfortable to-day; can hear best in the open air. Introduced the tympanum himself, he finding out the right spot; for if he pushes it too far, it is of no use to him. He has been testing his powers of hearing by a clock.

24*th.* Returned to-day and states that he cannot hear

so well; when, upon examination, I found the Eustachian tube blocked up again with mucous accumulations. I again dilated it with a series of injections of warm air; and on filling up the ear with a weak solution of cupri sulphas, by making an effort to swallow, air passed up in bubbles through the liquid. This effort to swallow, with the nose and mouth closed, I told him to make each day when he removed his artificial membrane, so as to keep the tube pervious.

Conclusion.—This patient continued to visit the Infirmary twice a week until the 17th of March, when he left for the country, having but slight discharge, just sufficient to moisten the artificial membrane; being able to hear conversation with ease and comfort, and even the ticking of an ordinary clock across a room.

The Mode of applying the Artificial Membrana Tympani by Mr. Toynbee.

"As, in cases of perforation or destruction of the membrana tympani, there is so frequently catarrhal inflammation of the mucous membrane of the tympanum, it is obviously important that no foreign substance should be placed in contact with that membrane; and as there is always a margin of the membrana tympani remaining, the object of the surgeon should be to keep the artificial membrane external to the latter. After carefully noting the size of the inner extremity of the meatus to which the natural membrana tympani was attached, the operator should then cut the artificial membrane as nearly of the size and shape of the natural one as possible, taking care at the same time to keep the margin quite smooth and

regular. In cases where only a small border of the natural membrane remains, it is often desirable to cut the artificial membrane of a size larger than the inner extremity of the tube, so that its edge may turn outwards.

"The patient must then be placed with the head inclined to the opposite shoulder, while a strong light is thrown into the meatus, which, if liable to discharge, should have been previously syringed. The operator will now take the artificial membrane, and having moistened it with water, pass it, by means of the silver wire, gently inwards until it has reached what he considers the natural position. This he will ascertain by the occurrence of a faint bubbling sound, caused by the escape of the slightly compressed air beyond it; he will also feel a slight obstruction offered to its further passage by the remnant of the natural membrane. Should he attempt to pass the artificial membrane beyond this point, the patient will complain of pain, which until then had not been felt. The most certain test, however, of the artificial membrane having been properly placed, is the sensation of the patient, who discovers, by the sound of his own voice, or that of the surgeon, or by the movement of his tongue and lips, that his hearing has been suddenly much improved.

"It will be imagined that great care must be taken to cut the membrane so that it shall fit the inner extremity of the meatus with exactness, since if too large it would cause discomfort; and if too small, it would not fulfil its purpose of rendering the tympanum an air-tight cavity.

"The surgeon having ascertained that the artificial membrane is beneficial to the patient, if no pain is experienced, it may be allowed to remain in the ear for a few hours, and

gradually increased to the whole day. It is often desirable that the use of the membrana tympani should be preceded or accompanied by vesication over the mastoid process, whereby the thick mucous membrane of the tympanum may be rendered more healthy. In all cases the artificial membrane should be removed at night; and, when there is any discharge, the ear ought to be syringed each night and morning with tepid water."

I cannot finish this subject without giving some account of the Self-adjusting Artificial Tympanum of Mr. Yearsley, which consists of a piece of wetted cotton, which has a tendency to produce partial or complete closure of the perforated membrana tympani. In the year 1848, Mr. Yearsley published his method, but the great drawback to its usefulness has been the difficulty of applying it with such nicety by the patients themselves as is necessary to its success. In a recent publication,* Mr Yearsley has improved his method, so that the most timid patient may apply the remedy with safety and ease.

"A piece of cotton is to be attached to a thread and drawn through a silver tube about two inches long, so as to bring the cotton against the extremity; then wet the cotton, introduce it, and move about at the bottom of the passage until it reaches the spot at which the hearing is improved; the thread may then be let go and the tube withdrawn."

The next subject we shall pass to will be the use of Hearing Trumpets to aid the deaf in hearing.

* Med. Times and Gazette, Dec 20, 1855, and Braithwaite Retrospect, July, Part xxxv. 1857, p. 146.

CHAPTER V.

HEARING TRUMPETS.*

The following is a list of the most recent forms of hearing trumpets in use in Europe and this country.

1st. Earcap or reflector, small funnel shaped ear-trumpet to remain in the ear.

2d. Ear-trumpet of copper, turning on its self and touching the auricle of the ear, which holds itself in place.

3d. Acoustic ears of silk solidified with caoutchouc, being easily hidden under the bands of the hair, the same as the two preceding instruments. [These are called auricles, and are only useful to listen to a sermon or a public lecture.]

4th. Chin hearing pieces of the same nature.

5th. Breast pieces of the same nature.

6th. Hearing Trumpet of copper in the form of a shell.

7th. Hearing Trumpet of brass, in a single piece.

8th. Acoustic trumpet of brass, elongating and shortening in the manner of a long telescope.

9th. Hearing flexible tube, formed of a long spiral thread of iron wire, covered with a tissue of silk or caoutchouc, and furnished with a mouth-piece of cocoa or horn, to be placed in the ear. [This form has been found of

* Maladies de L'Oreille. Par Dr. Triquet. Paris. 1857. p. 457.

considerable use by a number of moderately deaf persons in this city, who use them when in conversation.]

10th. Hearing tube, allowing three persons to converse with a deaf person.

11th. Bouquet for hearing, permitting two deaf persons to converse together.

12th. Hearing basket of flowers.

13th. Hearing cane.

14th. Hearing ball costume.

15th. Miss Martineau's parlor (large) Hearing trumpet. [This form of trumpet is the only one for general conversation, and is recommended by Mr. Wilde, but its use is very trying to the ear as stated by Dr. Triquet, causing great confusion of sounds.]

16th. Hearing stand for candlestick.

17th. Hearing easy chair.

18th. Hearing pulpit for a preacher, or a professor, who wishes without elevating his voice too much, to be distinctly heard by his hearers, and even by deaf persons, who might happen to be in the audience.

Observations.—The first eight instruments having only given negative results, that is to say, that with the assistance of these trumpets, hearing has not been much improved. The hearing head-dress for the ball, should be placed also in the same list.

These instruments greatly augment the intensity of the sound, but the objections to most of them is, that they produce a confusion of sounds or noise at one point, so that the deaf person is unable to distinguish clearly what is spoken. Even in the healthy human ear, when these instruments are employed for a short time, it

causes a high state of irritation by the confused noise which they produce, even when spoken into with a low voice, and that their use would soon injure the most healthy constituted ear; therefore, persons suffering from deafness, could not bear them long without increasing their infirmity.

The results obtained from these instruments so far, have been very unsatisfactory, compared to those procured from spectacles, microscopes, &c. The whole subject of acoustics, as applied to hearing, requires reinvestigation and application.

Observations on a new form of Ear Trumpet.—Having found most of the ear trumpets defective in collecting sounds so as to render them distinct to a deaf aged lady patient of mine, upon reflection and consultation with the *latest* authorities on the subject of acoustics, and finding that ear trumpets generally are so constructed as not to have a true focus, I resolved, therefore, to have an instrument made of a spherical form, for it is well understood, that cylindrical forms give what is called a caustic* in optics, while a spherical form gives a true focus; or in other words, collects the sounds from all parts of its surface, and conveys them to one point of space. From a drawing of mine, an ingenious artisan constructed a model in block tin, and the lady informs me, that it affords her more satisfaction than any instrument she has ever used. In numerous experiments which she kindly allowed me to make, in which I employed several of the ordinary forms of trumpets, she could hear a conversation one yard further and much more

* Acoustics applied to Public Buildings, Smithsonian Report. p. 230. 1856.

distinctly by my instrument. It is only 8 inches in length, curved about 1 inch : 2 lines less than 4 inches at its spherical end, and the opening at its base is 1 inch, gradually tapering to an external orifice, which enters the ear, of 3 lines diameter.

CHAPTER VI.

THE DEAF AND DUMB.

I cannot in so small a work enter into a history of mutcism, nor of the early effort made to instruct them by the labors of the good Jerome Carden of Italy in 1576 and Petro de Ponce in the sixteenth century, those who are curious on this subject I can refer to the able investigation of Wilde and others. My object will be to make the work now offered to the public, one of utility, by giving from the report* of our noble Pennsylvania Institution, the third founded in this country, an outline of its history and mode of instruction, and also a valuable letter on the Cure of the Deaf and Dumb, by Dr. Meniere.

"The Board of Directors of the Pennsylvania Institution for the Deaf and Dumb was organized, and held its first meeting in April, 1820. President, the Right Rev. William White, D. D.

In November following, a house was rented in Market street, above Broad, and eighteen pupils assembled in it for instruction.

The Institution was supported by donations, and the contributions of annual subscribers and of life-members.

* The Annual Report of the Pennsylvania Institution for the Deaf and Dumb, Philadelphia, 1853.

An Act of incorporation was passed by the Legislature of Pennsylvania, in February, 1821. By this Act, the Commonwealth allowed one hundred and sixty dollars a piece per annum for the education and support of indigent pupils of the State. The number was not to exceed fifty, and the term of each not to extend beyond three years. The number has since been increased, and the term extended by several successive enactments. The number under the present appropriation being ninety-eight, and the term allowed six years.

In September, 1821, the Institution was removed to the corner of Market and Eleventh streets.

In June, 1824, a site was purchased at the corner of Broad and Pine streets, and preparations made for erecting a large building.

It was completed, and the Institution removed to it in November, 1825.

In 1828, an additional lot in the rear was procured, and a school house erected on it.

In 1839, the buildings were extended, and a story added to the school house. The whole establishment was then capable of accommodating one hundred and fifty pupils.

A chaste and simple Doric front of cut stone, with portico and pillars, extends ninety-six feet on Broad street. The buildings, including the school house, run back two hundred and thirty-five feet, and enclose an open space laid out as a flower garden.

There are two spacious yards, one for the girls and one for the boys, shaded by trees, and furnishing ample space for exercise in the open air.

The school building contains ten school rooms. Each one provided with appropriate furniture, as slates, tables, closets &c., when needed. From twelve to twenty pupils usually constitute a class.

At present there are eight classes, each under the care of an instructor.

Two of the teachers are mutes. These classes are formed in October, and it is important that all new pupils should be here at that time, that the classes may be properly arranged.

Contiguous to the school rooms is a Cabinet of apparatus, models, specimens, &c., to assist the teachers in presenting clear ideas on the various subjects, admitting of ocular illustration.

The centre building contains a lecture room, capable of seating two hundred persons. It has also facilities for making experiments, and presenting diagrams, maps, sketches, &c. In this room the pupils are assembled twice every day, sometimes in the evenings for lectures, and on the Sabbath for religious instruction.

Underneath this apartment is the dining room, in which the pupils assemble through opposite doors, without interfering with each other. In the upper stories are the infirmaries, and also two dormitories.

The wings contain the principal sleeping rooms, the sitting rooms, the shops, the kitchen, bake-house, laundry, cellars, &c.

Attached to these are the bath houses, washing rooms, and other conveniences, accessible at all times without exposure to the weather.

The workshops give employment to the boys two or three hours daily.

The girls are taught plain sewing and dress-making, and are employed in housewifery. Habits of industry are thus forming, and the pupils are preparing for the duties and practical business of life. The hours of the day are apportioned to study, work, exercise and amusement.

The establishment is lighted with gas, and abundantly supplied with the Schuylkill water.

During the thirty years of the existence of the Institution, there has been expended for the grounds, buildings, appurtenances, &c., about ninety-five thousand dollars.

The pupils are under the constant supervision of the Principal, the Instructors, the Matron, or the Steward. The indisposed have the prompt and devoted services of the attentive and skillful Physician, and in critical cases, the valuable advice of the distinguished consulting Physicians of the Institution. Thus, in sickness and in health, the improvement, comfort, and happiness of the pupils, are assiduously promoted.

Instruction.—Some persons have desired to know something of the mode of instructing deaf mutes. It is not easy, however, to convey a clear idea of it to those who are not familiar with signs.

It is by means of signs that the process of teaching the deaf and dumb is principally conducted. When we look at the Chinese characters on a tea-box, we can see no meaning in them, and might so look forever, without becoming any wiser. So also with the mute. Our written or printed words, are as inexplicable to him, as the Chinese characters are to us, and inspection alone could never afford any clue to their meaning. An interpreter or a book, could speedily convey to us the meaning of the characters through the medium of our language, with which we have

been familiar from early infancy. But the deaf mute has no language. To enable him, therefore, to learn the meaning of our words, he must acquire a language, through which he can get that meaning. Every mute of tolerable capacity makes use of motions to indicate assent or denial, approbation or repugnance, as well as some common objects and familiar actions. On these motions, limited and imperfect as they are, we graft by degrees a system of signs, which enables us finally to communicate considerable knowledge on many subjects, and to develop and call into exercise, the faculties of the mind. These signs convey thought, and have no resemblance to words, but they enable us to define words, explain their relations to other words, give their arrangement in sentences, and the different meanings which are attached to them. This language of signs can only be acquired from the living teacher. Incomprehensible as it may seem to a speaking person, unacquainted with the subject, that thought, however abstruse or refined, may be conveyed by varied motions of the arms, it is nevertheless true, and a system of these motions is the grand means of instructing the deaf and dumb.

This being premised, a class of ten to twenty mutes, is furnished with large slates on which to write with chalk, crayon or pencil. The instructor presents an object or a picture of one, or makes a sign for it. He then teaches them to write the name, presenting each letter by the manual alphabet. When they can all write it, it is erased and rewritten a number of times, till it is impressed upon the memory. Some information may be communicated respecting the object.

Questions may be asked to induce the pupil to think. In this way a number of nouns are taught, so that when a concise sign is made for one of them, it will be readily written. In the same way words expressive of the qualities and properties of bodies may be taught. When such words are presented with appropriate nouns, the pupils write them in connection. They are then required to give examples of similar combinations from their own resources. This is the first attempt at composition.

Another step will be to make signs for actions, and teaching their names. Then the use of these words in combination with the words already familiar, as "a boy sees a horse"—"a boy sees a strong horse." Again, some of the words expressive of the relations of objects, may be taught, as "a lady sits on a chair"—"a bird flies into a cage." Other words and other ideas are presented to them. They endeavor to express the ideas in writing, using the words and forms of arrangement which had been taught. These sentences are corrected, and the pupils are required to give examples of their own. These original efforts are also corrected. The connections of language, the abstract terms, the phrases and the idioms are successively taught. Series of sentences, anecdotes, narratives, &c., are written off and explained by signs. These are copied by the pupils and studied as evening lessons, and in school are written from memory, or recited by signs. There are other evening exercises, such as writing a number of original sentences on single words—composition on particular subjects—letters, &c. From time to time the elementary principles of arithmetic and geography are taught. Indeed, our illustrations of words and principles are drawn from the

sciences, and the whole range of human knowledge, so that in the course of their education a great amount of knowledge is communicated to them. The subjects of arithmetic, geography, grammar, history, &c., cannot be taught systematically till the latter part of their course, when they are supposed to have acquired a considerable command of written language.

Moral and religious subjects have also a large share of attention. Much useful information is communicated by lectures, addressed in the language of signs, to all when assembled together.

It will readily be inferred from these statements that much will depend upon the capacity of the pupil, his attention and his diligence. There can be no set course or limited periods for certain studies, which, when completed, make an educated person.

The longer the mute is under instruction, the greater will be his command of language.

It will also be perceived that much depends upon the knowledge, ingenuity and tact of the teachers in the use of signs.

The language of signs is the all important instrument by which the educator is to reach the mind of the mute pupil, in his early and his later efforts. By this alone can he lead the pupil to reflect on his own mental operations, feelings, motives, emotions and passions, and thus learn the thoughts, feelings, &c., of others, and to understand and use the language employed to express ideas on these subjects. When this point is reached the pupil may relinquish, entirely and forever, if he please, the use of signs.

A new instrument has been given to him, by which he

may explore the world of books, and communicate with his fellow men to an unlimited extent. From this point, self-education may be carried on, and continued to the end of life, through written language.

It should be remarked, however, that a large number of mutes do not reach this point, from want of capacity, yet the acquisitions even of such, are probably as valuable, in proportion, as those made by the more gifted. The proboscis of the fly, is doubtless as important to the little insect as the trunk of the elephant is to that sagacious and majestic animal.

Directions for Teaching Deaf Mutes at home.

It is very important to the deaf mute, that his parents and friends should cultivate the language of signs, and encourage him in the use of them as early as possible.

Let them observe the child, and imitate the signs he makes. When he is pleased with anything, invent a sign for the thing, and repeat that sign many times afterwards. Distinguish different persons by signs, suggested by a scar, mole, beard, or any little peculiarity which the person may possess.

Imitate the actions of riding, sewing, eating, mowing, cutting, throwing, sowing, &c.

For "good," kiss the hand. For "bad," bring the hand to the lips, turn the palm down, and throw it from you. For "glad," pat the heart rapidly, with a cheerful expression of countenance. For "sorry," rub the clenched hand on the heart, with a sad expression of countenance.

For "black," draw the end of the forefinger along the

eyebrow. For "red," touch the lips with the forefinger. For "love," cross the hands and press them on the heart. For "hate," push both hands, the palms out, from the heart, as if repelling something from the left side. For "lie," move the forefinger across the mouth horizontally. For "true," place the forefinger perpendicularly across the lips and thrust it forwards.

These are a very few examples, merely as suggestive hints.

The child can be taught to spell on the fingers at a very early age.

Any person can take an object, as a hat; pick out the letters h-a-t from the Deaf and Dumb alphabet, and learn to place the fingers in the true position for each letter. No matter how slowly it is done. Let the child imitate until he can make the letters of the word in order without assistance, at the same time show the object. Do this very often, until the child has learned to spell the word when the hat is presented to it, or to go and bring the hat when the word is spelled to it.

Then take another object, as pin, go through the same process until it is thoroughly learned by frequent repetition every day. So with arm, cat, dog, chair, &c. The following ten short words, the names of common objects, contain every letter of the alphabet, viz: adz, fan, map, cow, box, jar, sky, hat, quill, glove.

After the power of spelling the names of many common objects has been acquired, the names of familiar persons may be taught.

In a similar way, the child may be taught to write the names of things on a slate quite early. Let him imitate

the form of the letters for one word, as hat, and repeat it many times, until he can write it as readily as he can spell it on the fingers. Take another word, and go over the same process. Point to each letter, and require the child to make the sign for the letter on the fingers. By frequent repetition, the ability to write the names of many things, and to form all the letters of the alphabet, will be acquired. It is best to make the child form the letters as round as possible, and not to take off the pencil until the word is completed. The habit thus early begun, will save a great deal of time, and enable the writer to accomplish more in a given time, and with more ease than can possibly be done on any other principle. If it is desired to go further, write the name of the child, as John sees a chair—John sees a table. Let him copy the sentence, explaining by signs the word sees, and pointing to the chair, and also to the child. Then let him write John sees—and let him select another object to fill up the blank; and finally let him cover his slate with sentences thus formed. Help him to objects out of the house as well as in. Encourage him to write as many such sentences as he can. All this may be the work of years, but the advantage to the child cannot be estimated. A little attention, thus bestowed, every day, will accomplish all this, and probably much more."

ON THE CURE OF DEAFNESS,* [DEAF DUMBNESS.]

LETTER OF DR. MENIERE.

Mr. President:—My title of Physician to the Institution of the Deaf and Dumb, perhaps, demands that I should not remain a mere spectator of the debate which is now agitating the Academy; but the respect due to propriety has hitherto prevented me from breaking silence; as I wished to leave to your illustrious body itself, the care of answering the official questions. Though this feeling of deference for the initiative of the Academy, was not relished by everybody, still I should have remained silent in the apprehension that my interference might have been attributed to personal interests. But several honorable members of the Academy having appeared astonished at my silence, and not having appreciated the reasons which I gave for it, I can no longer remain indifferent. Permit me, therefore, Mr. President, to furnish to the judges of this question, the tribute of the observations which I have

* *From the American Annals of the Deaf and Dumb, edited by Luzerne Rae.*

[The Imperial Academy of Medicine at Paris, having been requested by the Minister of the Interior, to give its opinion of a work on the *Possibility of Curing Deafness*, by Dr. Blanchet, referred the matter to a committee of its members. On the 12th of April last, Prof. Piorry reported, in behalf of this committee, the result of its investigations. In the course of the discussion which followed, a letter from Dr. Meniere to the President of the Academy, was read by the Secretary, Mr. Dubois. This letter appears in the *Moniteur*, the "official journal of the French empire," of May 5th; for a copy of which paper we are indebted to a friend in Paris. At our request, Mr. Clerc has translated Dr. Meniere's letter, which, we trust, will be found worthy of the place it occupies in the ANNALS. It will be seen that Dr. M. adds his testimony to that of other persons who have carefully studied the subject, in regard to the ill success which has hitherto attended all efforts for the permanent cure of the deaf.—EDITOR.]

been able to collect in my particular position. I needed this encouragement, and I beg the Academy to grant me a few minutes of kind attention.

Fifteen years spent in the Institution for the Deaf and Dumb at Paris; a visit (not official, it is true) to most of the establishments of this description which exist in France, Italy, Spain, Switzerland, England and Germany; an attentive study of the best works published on deaf-mutism; the habitual intercourse which I have had with the most competent men on this matter; the examination of a great number of deaf and dumb persons, both children and adults, belonging to all classes of society; perhaps authorize me to form an opinion of this kind of infirmity, whether congenital or accidental, of the consequences which it draws along, and finally, of the possibility of its being cured. Such an opinion I solicit the favor of expressing in a few words.

We are generally apt, in the proud sense of our own perfections, to pity those who do not possess them as fully as we do. The pity which the deaf and dumb inspire, takes its source in a tacit comparison; few of them, however, are disposed to accept it; and among the more instructed and more intelligent, many are found who entirely reject that sympathy, the motive of which wounds their feelings. The deaf and dumb think themselves our equals in everything; the resources which they believe they possess, to communicate among themselves, and with those who speak, are, in their opinion, sufficient for them, nor do they think themselves much to be pitied, because they do not hear what we say. It is an illusion in which it would, perhaps, be generous to leave them.

Whatever it may be, deaf-mutism is very truly an infirmity, as it is an organic imperfection which places those who are afflicted with it, in a state of inferiority to those who hear; it is then indispensable to resort to science in order to repair a misfortune more or less grievous to the person whom it has befallen. But what is to be done? Can we cure such defects, or if not, can we improve the sense of hearing to such a point as to render conversation possible? If we could resolve this problem, it would indeed be a great benefit, and statues should be erected to the honor of the successful inventor of a method capable of restoring the unfortunate deaf and dumb to their normal conditions. Nobody, certainly, need to despair of the future; it is not in a century like ours, in which the wonders of science are every day discovered, that we should renounce the hope of rendering so great a service to humanity, but we must acknowledge that, hitherto, all attempts have failed.

My position at the Paris Institution has procured me the advantage of seeing the operations of a certain number of pretended *curers of deaf-mutism.* An English physician, patronized by two members of the Academy, tried, in my presence, the experiment of distilled water, containing, according to all appearance, a preparation of *aconite.* He added to this specific, mechanical excitations of the ear, a gymnastic of hearing, to the great admiration of many spectators, who wondered at the auditive vibration caused by these excitations: but the deaf and dumb children submitted to these experiments, have not ceased to figure among the number of the pupils of the Institution, in spite of the promises of the operator, who was to open to them the doors of the speaking and hearing world.

Another personage having obtained the honor of a commission from certain members of the Academy of Sciences, practiced for a month, and under my eyes, certain operations destined to awaken the sensibilities of the ear of ten deaf and dumb persons taken from among the pupils of the Paris Institution. I took notice not only of the feats and gestures of that personage, but also of the results obtained at the close of each sitting. This series of proceedings, the most circumstantial, and the most exact, served as a basis to the labor of the learned reporter, and it has been demonstrated, in the most evident manner, that this enthusiastic *curer* did not produce any change at all in the situation of the deaf and dumb who had been intrusted to him.

Another, still bolder, (it was nothing but self-confidence,) durst apply the crown of his trepan to the skull of a young girl who is now among the pupils of our Institution. By that opening, the child was to perceive the sounds; the child was to hear. But the child does not hear at all, or at least, it is still deaf and dumb, and we do all we can to protect its head against the exterior shocks which might easily kill it.

Has the actual attempt on the value of which the Academy is now called to pronounce, attained the object? Has an experiment which dates from the end of 1847, and which was pursued with singular perseverance, finally given satisfactory results?

Does it ensue that because some partially deaf and dumb persons succeeded in perceiving certain sounds, these poor children cease to belong to the category of individuals who can communicate with the hearing only by means of arti-

ficial methods? When, with the aid of an *acoumeter*, we learn what number of vibrations is wanted to shake less the ear than the skull of a deaf and dumb person, ought we to conclude thereby that the articulated voice, or the musical word, so delicate, so intellectual, will be perceived by an organ weakened, vicious or dead?

It suffices to have studied these little prodigies, to be convinced that the *speaking* deaf and dumb do not hear, but speak by seeing. Those who have no interests to feign, ingenuously acknowledge that the hand placed before the mouth of their interlocutor, breaks, in an instant, all communication with him, so that it is always the eye which substitutes itself for the ear, and causes to the ignorant spectator, the simple or silly astonishment, the explosion of which soon takes place.

I might say more on the subject of these medical illusions. The love of science and humanity is not always the noble object a man proposes to obtain. In resorting to this insatiable desire for curing, which broods in the heart of the parents of the deaf and dumb child, we find ourselves in the presence of an active credulity. Magnetizers, somnambulists, homœopathics, empiricists of every kind, are eager for this work; the promised, as well as the hoped for benefit, will make us wait long; it will not arrive; but if the child is intelligent; if its partial deafness permits it to utter some words; if its rapid eye learns to read on the lips of the speaking person, there is enough to satisfy the lets exacting, and the curers record a new triumph.

Will the rigid appreciator of facts of this kind, be contented with such success? Will the Academy of Medicine grant its high sanction to such results as these? We are

permitted to doubt it, so much the more because, as said the Hon. Mr. Gueneau de Mussy, with so much force, "the means employed to cure the deaf and dumb, have nothing new, nothing special." What matters it? The sonorous instrument is of little importance when the only question is to awaken the sensibility of the ear. The orgue, monochard, acoumeter, do not possess specific qualities; the shaking communicated to the nerves of audition by all these agents, is a fact of uniform nature, whatever may be its point of departure, its character, &c. No one, as far as I know, has yet discovered in the vibrations of any body whatever, an occult virtue, and never will the art of making a noise for the benefit of the deaf and dumb, merit the honor of being called a *method*.

When by the couching of a cataract, or by the opening of an artificial pupil of the eye, a dexterous hand gives passage to a lucid ray, which falls upon a sensible retina, the phenomenon of vision immediately manifests itself, and very little practice is necessary for the previously blind man to take an exact knowledge of objects. Will it be the same thing when a sound reaches an auditory nerve? Will the vibration experienced by the labyrinthian apparatus, suffice to give to the brain the faculty of comprehending the word; to establish by the aid of this new communication, the intellectual relations usually existing between individuals who hear? You know, Mr. President, and the Academy is not ignorant, that Dr. Itard demonstrated, not long since, the impossibility of such a relation; nay, the absolute difference which exists between those two forms of comparison. It does not suffice to hear a little in order to hear enough; the child which, on coming into the world,

has a certain weakness of hearing, is irrevocably condemned to remain in an exceptionable class; he is deaf and dumb; he must by absolute necessity use artificial means, to make himself understood by other men; he is deaf and dumb; he will remain deaf and dumb; not one fact warranted by sound criticism, has yet come to protest against this judgment; and what has taken place in our own time, is far from supporting a contrary opinion.

Let us reserve the rights of the future. I am willing. Let us hope that, one day, the isolation of the deaf and dumb will cease; but in the mean time, the men who live in the midst of these unfortunates, and who keep a record of acquired experience, should think of coming to the relief of those whom this infirmity assails, and seek to resolve the following problem: *A deaf and dumb person being given, to endeavor to make him the best person possible.* The question thus put in its generality, without referring to individual differences; without adhering with charitable predilection to some scarcely privileged deaf and dumb, capable of articulating sounds and reading words on the lips; by playing well the part imposed on us by Providence, who welcomes all the unfortunate, and equally bestows its benefits upon them; by following the way which is truly worthy of a human government; we must do what is done in France, receive all the deaf and dumb, and offer to them all the means of communication we are able to afford. Reading and writing, the alphabetical signs, the signs of convention, the articulation of sounds, reading on the lips, all these means compose the system of education put in practice in the two principal schools at Paris and Bordeaux, as well as in most of the departmental and private institu-

tions. To be willing to confine one's self to one of these proceedings would be considered as failing of one's duty, and knowingly abandoning to radical ignorance all the children who have not much intelligence, and whose vocal organs are essentially deficient. In one word, it would be doing what is done in certain countries where, by successive eliminations, all efforts come to be reserved for those who can the best profit by them, and who, even in the absence of those efforts, would find sufficient resources to create for themselves, in some way, sufficient means of communication with their fellow-citizens.

Hitherto the public administration in France has proceeded more generously. The State has better comprehended its duty, it has admitted into the Imperial establishments all the deaf and dumb who are not idiotic; it has liberally tendered the most various instruction to all these unhappy children, besides a manual profession capable of insuring their subsistence; it has supplied them with a mass of general knowledge, which places our deaf and dumb a great deal above the average obtained in the countries where an opposite method is adopted. Permit me, Mr. President, to submit to the Academy a fact of great importance in the examination of this delicate question.

In 1847, there was at Pforzheim in the Grand Duchy of Baden, a congress of all the teachers of the German deaf and dumb. Invitations had been addressed to the professors of the neighboring countries. Mr. Morel, now Principal of the Bordeaux Institution, attended that convention. He is familiar with the German language. He took an active part in the acts of that assembly; and it

results from the verbal proceedings collected by this honorable professor, that the French pupils generally instructed by the mimic method possess, after studying a certain number of years, a more extensive knowledge than those who, by great exertions are taught to speak.

The reason of this difference is very simple. Much less time is required to learn a fact, than to express it in words; ideas are better than words; a child has more interest to know than to say; intellectual furniture is a hundred times preferable to the articulation of certain sounds. Our pupils in the Paris Institution know a great deal more than they can express; in a word, ours think much while theirs endeavor to say a little.

Such is the summary of a conference in which the French professor had to struggle against men devoted to another system; but the German professors have been brought by evidence to see that the method followed in France, agreed better with a majority of the deaf and dumb, and incontestibly gave them a greater intellectual value, and rendered them more useful, better and more fit for the society in which they are called to live. We voluntarily acknowledge on our part, that the oral method is more satisfactory to those who live with the deaf and dumb; but I may be permitted to say, that between two egotisms, it is but just to give the preference to that of the more interested party. The deaf and dumb, it is not to be denied, are less made for us than we are for them; it becomes us who are the rich, the favored, to descend to them; we ought to take the first steps and not to impose upon them the torture of articulating with much pain a few words which they do not understand, and which they

renounce as soon as they are no longer under the eyes of their masters: in one word, the deaf and dumb, whatever may be said to the contrary, form a class apart; they want artificial methods to put themselves in communication with us; we ought, therefore, to furnish them with the greatest possible number of these means of communication, and hitherto France has not failed in her duty toward her children, deprived by nature of the sense of hearing.

The Paris Institution is at once a school of literary instruction and an industrial establishment. There is given to all the deaf and dumb, a practical education sufficient for the generality of pupils; and moreover, various kinds of trades are taught, which class them among the active and useful members of society. But there are intellectual wants of a higher nature, and it has been felt that a more refined aliment was necessary for the most intelligent pupils. There had been for them a kind of normal school which recruited itself from among the most skilful; but the ingenious philanthropy of Dr. Itard has regulated this disposition, and has rendered it obligatory and permanent; he has, with a generous hand, endowed the *Class of Perfection*, in which, after concurrence, the most distinguished pupils of the Institution are received, and the latter soon become teachers in their turn.

Thus the Paris school endeavors to make good deaf and dumb citizens; deaf and dumb instructed, moral, laborious; deaf and dumb provided with all the means of communication with other men; they write rapidly; in the absence of pen or pencil, they have the manual alphabet; this failing, (as when speaking persons do not understand it,) they have pantomime, so expressive, so clear, so rapid; finally,

when no one of these means can reach the stupid mind of an ordinary speaking person, the articulation of sounds comes to the succor of both, and some phrases more or less correctly *pronounced*, remove the obstacles between the two interlocutors. If the speaking person articulates well; if he takes care to speak slowly by emphasizing all the syllables; if his mouth is well shaped; if it is not hidden by a long beard; if his face is sufficiently expressive, then the deaf and dumb man can read on his lips; and this is the last means of understanding each other. But all these conditions are not to be had as easily as can be imagined; either the one or the other, too often, is wanting, and all these advantages so laboriously acquired, are rendered useless.

Reading on the lips is an art of infinite delicacy; an exercised eye is necessary; but here, the eye is even less useful than quick and bright intelligence; a phrase must be guessed by the aid of a word hastily seized. The logical induction which leads like a dart, from a word to an idea, must be resorted to; and this is so true, that but a small number of individuals are found, who can acquire much of this marvelous faculty. Those who, hitherto, have attained the highest degree of perfection, belong to families in which every thing has been done, to attain this object. These are miracles of maternal love, prodigies of patience required, and yet these are only efficacious among children who are most fortunately endowed with intelligence.

I believe, Mr. President, and I dare hope that the Academy will also think like myself, that from the nature of these rare and exceptional cases, it is impossible to make a uniform rule of public instruction; three-fourths of

the deaf and dumb, entirely so or not, submitted to this system of instruction, will not derive any real profit. These views prevail at the Paris Institution for the deaf and dumb. The State, in its active generosity, dispenses instruction to all those who cannot acquire it by ordinary methods. For the deaf and dumb it establishes schools in which experienced teachers impart to those deprived by nature, all the knowledge they need, to discharge the duties of useful citizens; it does not look for imaginary perfection; it contents itself with meliorating evil, diminishing misfortune, and restoring to the great human family those among its children, whom ill-fate has separated from it.

In conclusion, no one has ever cured deaf and dumb persons; the possibility of this art of healing is still confined to the number of the *Desiderata*, the most uncertain of science.

The attempts renewed ever since 1847, have remained unsuccessful, and it should be so, for they differ in nothing from those which preceded them, and which had already proved abortive.

The auricular education of the deaf and dumb ought to be considered impracticable; it can only succeed with one who has been cured of his deafness.

The above article was translated from the French by Laurent Clerc, Esq., himself a deaf mute, and many years ago one of the celebrated pupils of the Abbe Sicard. Mr Clerc, in connection with the Rev. Thomas H. Gallaudet, LL.D., introduced the present system of deaf-mute instruction into our country, and thirty-two years ago introduced it also into the Pennsylvania Institution, of which he then

had the charge. He has been in the field of deaf-mute instruction for a period of nearly half a century, and is still actively and successfully engaged in his benevolent labors.

In accordance with the opinion of Dr. Meniere in regard to the probability of restoring deaf-mutes to hearing, we find the following passage in the appendix to a recent work on Aural Surgery, by Dr. Wilde, of Dublin:—"Is deaf-dumbness curable? To this serious question I must reply in the negative. Except by miraculous interference, I do not believe the true congenital deaf-mute was ever made to hear; and those who lose their hearing so early in life as never to have acquired the faculty of speech, come into the same category."

INDEX.

PART IV.

DEFECTS OF HEARING.

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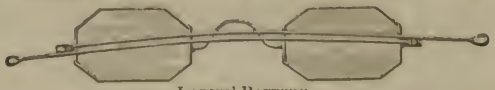

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